

351.3  
P539  
1916.

UNIVERSITY OF ILLINOIS LIBRARY

SEP 22 1919

# CIVIL SERVICE COMMISSION

PHILADELPHIA

---

## EXAMINATION QUESTIONS

FOR

---

# 1916

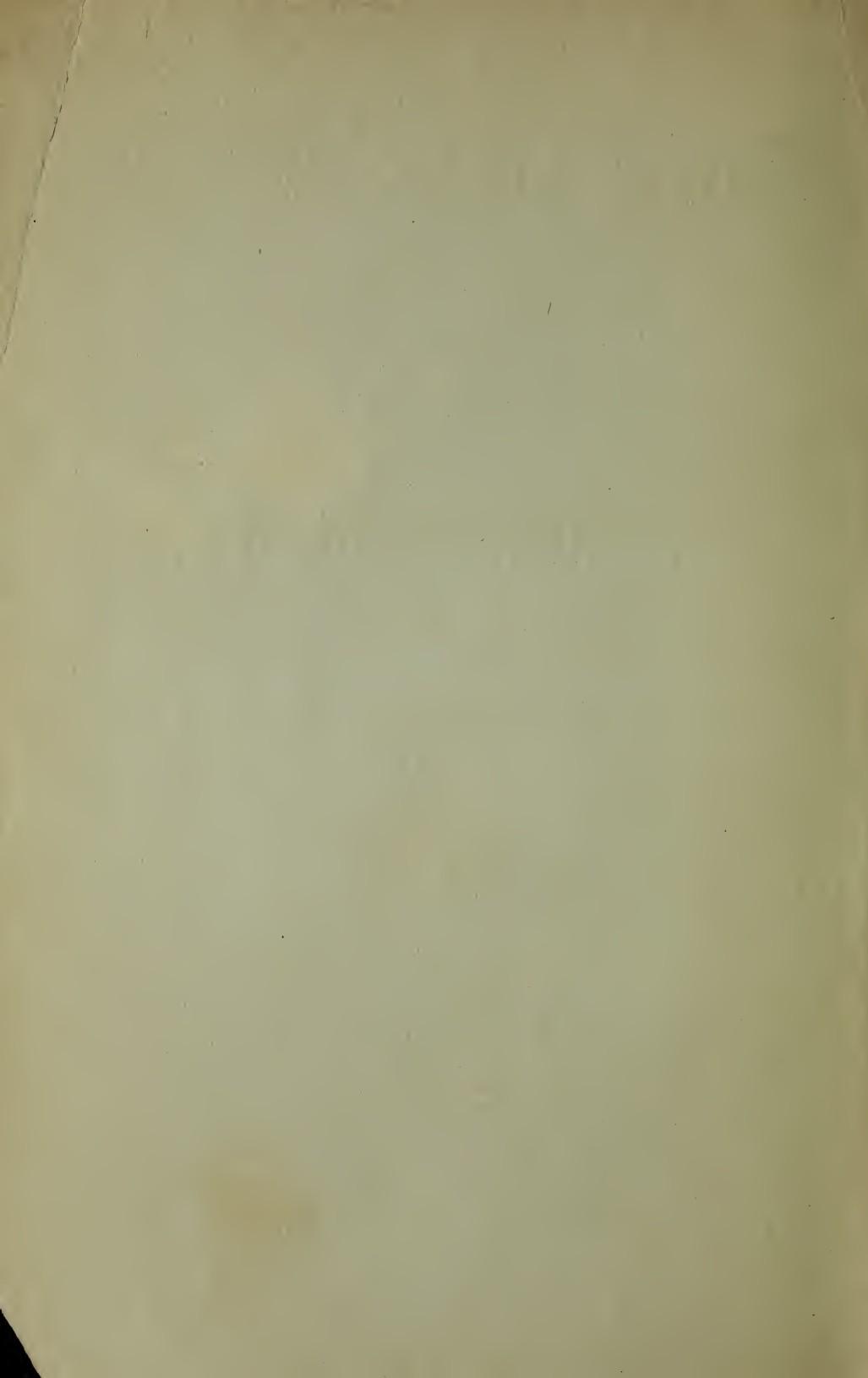
---

ROBERT M. GRIFFITH, President

WILLIAM H. KREIDER, Secretary

NICHOLAS ALBRECHT,

Commissioners



# **CIVIL SERVICE COMMISSION**

**PHILADELPHIA**

---

## **EXAMINATION QUESTIONS**

**FOR**

**1916**

---

ROBERT M. GRIFFITH, President

WILLIAM H. KREIDER, Secretary

NICHOLAS ALBRECHT,

Commissioners

---

WILSON A. DEILY, Chief Examiner



351.3

P539

1916

13 Oct. 1916

# INDEX

POSITION	ANNUAL SALARY	DEPARTMENT OR BUREAU	PAGE
Accountant, Clerk and . . . . .	\$1,400 . . . . .	City Transit . . . . .	59
Agent, Children's . . . . .	1,350 . . . . .	Charities . . . . .	283
Agent, Special (non-competitive) . . . . .	2,000 . . . . .	W., D. & F. . . . .	268
Agent and Visitor, Special . . . . .	750-1,200 . . . . .	Charities . . . . .	285
Anesthetist (Men and Women) . . . . .	900 . . . . .	Charities . . . . .	222
Antitoxin Laboratory, Helper in . . . . .	800 . . . . .	Health . . . . .	289
Apothecary, First Assistant . . . . .	600 . . . . .	Charities . . . . .	217
Apprentice, Second Year . . . . .	540 . . . . .	Electrical . . . . .	256
Architect . . . . .	1,800 . . . . .	W., D. & F. . . . .	146
Architectural Draftsman . . . . .	900-1,200 . . . . .	City Transit . . . . .	154
Architectural Draftsman . . . . .	1,200-1,500 . . . . .	City Transit . . . . .	139
Architectural Draftsman . . . . .	1,500-1,800 . . . . .	City Transit . . . . .	142
Architectural Engineer . . . . .	2,000-2,200 (Inc.) . . . . .	City Transit . . . . .	126
Asst. Apothecary, First . . . . .	600 . . . . .	Charities . . . . .	217
Asst. Bacteriologist . . . . .	1,200 . . . . .	Water . . . . .	272
Asst. Bacteriologist (Men) . . . . .	1,400-1,500 (Inc.) . . . . .	Health . . . . .	225
Asst. Bacteriologist, First (Men) (Promotion) . . . . .	2,000 . . . . .	Health . . . . .	225
Asst. Bacteriologist, Fourth (Men) . . . . .	1,000 . . . . .	Health . . . . .	226
Asst. Chief (Division Housing and Sanitation) . . . . .	1,900 . . . . .	Health . . . . .	2
Asst. Chief Clerk (Division Housing and Sanitation) . . . . .	2,000 . . . . .	Water . . . . .	9
Asst. Chief Clerk (Division Housing and Sanitation) . . . . .	1,300 . . . . .	Health . . . . .	10, 65
Asst. to Chief, Third . . . . .	1,600 . . . . .	Water . . . . .	120
Asst. Chemist . . . . .	1,200-1,300 (Inc.) . . . . .	Surveys . . . . .	273
Asst. Clerk . . . . .	1,000 . . . . .	Fire . . . . .	63
Asst. Clerk in the Laboratory (Men) (Promotion) . . . . .	1,200 . . . . .	Health . . . . .	36
Asst. Dentist . . . . .	700 . . . . .	Health . . . . .	228
Asst. Dietitian . . . . .	900 . . . . .	Charities . . . . .	287
Asst. Disinfector . . . . .	1,000 . . . . .	Health . . . . .	274
Asst. to District Surveyor, First . . . . .	1,200-1,400 (Inc.) . . . . .	Surveys . . . . .	122
Asst. to District Surveyor, Second . . . . .	1,000 . . . . .	Surveys . . . . .	157
Asst. Engineer . . . . .	900 . . . . .	Correction . . . . .	90
Asst. Engineer . . . . .	1,460 . . . . .	Electrical . . . . .	92
Asst. Engineer . . . . .	1,800 . . . . .	Health . . . . .	147
Asst. Engineer . . . . .	2,100 . . . . .	Highways . . . . .	109
Asst. Engineer . . . . .	2,500 . . . . .	Highways . . . . .	107
Asst. Engineer (Abolishment of Grade Crossings) . . . . .	2,500 . . . . .	Surveys . . . . .	117
Asst. Engineer (Grade Crossing Division) (Promotion) . . . . .	1,400 . . . . .	Surveys . . . . .	162
Asst. Engineer in Field (Sewage Disposal) . . . . .	1,800 . . . . .	Surveys . . . . .	159
Asst. Engineer, Principal . . . . .	4,500 . . . . .	Surveys . . . . .	114
Asst. Engineer of Sewer Plans . . . . .	3,000 . . . . .	Surveys . . . . .	121
Asst. Engineer in Charge of Testing Laboratory . . . . .	3,000 . . . . .	Surveys . . . . .	102
Asst. File Clerk . . . . .	900 . . . . .	Supplies . . . . .	61
Asst. Fire Marshal . . . . .	1,600 . . . . .	Police . . . . .	173
Asst. First (Testing Laboratory) . . . . .	1,500 . . . . .	Surveys . . . . .	150
Asst. Foreman . . . . .	3 a day . . . . .	Highways . . . . .	234
Asst. Inspector . . . . .	1,300 . . . . .	Boiler Inspection . . . . .	188, 192
Asst. Inspector . . . . .	1,000-1,200 (Inc.) . . . . .	Health . . . . .	194
Asst. Inspector of Meters . . . . .	750-900 (Inc.) . . . . .	Gas . . . . .	186, 191
Asst. Inspector of Test Borings (Sewage Disposal) . . . . .	1,000 . . . . .	Surveys . . . . .	207
Asst. Janitress (non-competitive) . . . . .	600 . . . . .	Board of Recreation . . . . .	291
Asst. Laboratory (Chemical) . . . . .	900-1,000 (Inc.) . . . . .	Surveys . . . . .	265
Asst. Laboratory (Machinist) . . . . .	900-1,000 (Inc.) . . . . .	Surveys . . . . .	266
Asst. Laboratory (Physical) . . . . .	1,200 . . . . .	Any . . . . .	144
Asst. Laboratory (Physical) . . . . .	900-1,000 (Inc.) . . . . .	Surveys . . . . .	97, 268
Asst. Medical Inspector . . . . .	1,400 . . . . .	Health . . . . .	231
Asst. Medical Inspector of Public Schools . . . . .	600 . . . . .	Health . . . . .	232
Asst. Milk Inspector . . . . .	1,020 . . . . .	Health . . . . .	201
Asst. Ophthalmologist . . . . .	1,200 . . . . .	Health . . . . .	229

1916 cont.

13 Oct. 1916

## INDEX.

POSITION	ANNUAL SALARY	DEPARTMENT OR BUREAU	PAGE
Asst. Pathological and Bacteriological Laboratory .....	\$720 .....	Charities .....	218
Asst. Photographer .....	600-950 .....	Any, except Police .....	275
Asst. Principal (Men and Women) .....	1,000 .....	Board of Recreation .....	292
Asst. Resident Physician, First (P. H. C. D.) (Men) .....	1,200 .....	Health .....	230
Asst. Resident Physician, Second (P. H. C. D.) .....	800 .....	Health .....	229
Asst. Sanitary Engineer .....	1,500 .....	Surveys .....	161
Asst. Superintendent (High Pressure Stations) .....	1,500 .....	Water .....	147
Attendants, Filter .....	800 .....	Water .....	244
Attendant, Lavatory .....	400-480 or As per Ordinance .....	Any .....	280
Bacteriologist .....	1,500 .....	Water .....	282
Bacteriologist, Assistant .....	1,200 .....	Water .....	272
Bacteriologist, Assistant (Men) .....	1,400-1,500 (Inc.) .....	Health .....	225
Bacteriologist, First Asst. (Men) (Promotion) .....	2,000 .....	Health .....	225
Bacteriologist, Fourth Asst. (Men) .....	1,000 .....	Health .....	226
Blueprinter .....	600-800 .....	Any .....	243
Boat, Fireman on .....	1,000 .....	Police .....	91
Boilermaker's Helper .....	As per Ordinance .....	Any .....	257
Bookkeeper .....	1,000 .....	Supplies .....	67
Bookkeeper (Promotion) .....	1,000 & 1,100 .....	Supplies .....	68
Bookkeeper, Clerk and (Grade Crossing Division) .....	2,000 .....	Surveys .....	41
Boss, Squad .....	2,000-2,200 (Inc.) .....	City Transit .....	140
Bricklayer's Helper .....	As per Ordinance .....	Any .....	243
Builder, Wharf .....	3.50 a day .....	W., D. & F. ....	257
Captain of Detectives .....	2,500 .....	Police .....	179
Captain of the Hall (Men) .....	600 .....	Charities .....	284
Carpenter .....	As per Ordinance .....	Any .....	246
Carpenter, Ship .....	3.50 a day .....	W., D. & F. ....	255
Caulker .....	3.00 a day 1,000 a year .....	Water .....	247
Chairman .....	600 & less .....	Any .....	114
Chairman .....	720 or less .....	Any .....	155
Chairman .....	600-720 .....	City Transit .....	101
Chauffeur (non-competitive) .....	1,000 .....	Public Safety .....	256
Chemist, Assistant .....	1,200-1,300 (Inc.) .....	Surveys .....	273
Chief .....	4,300 .....	City Property .....	1
Chief (Division of Investigation & Research) (non-competitive) .....	1,800 .....	Civil Service Commission .....	269
Chief, Dental Dispensary .....	2,500 .....	Health .....	221, 226
Chief .....	3,500 .....	Elevator Inspection .....	3
Chief .....	2,000 .....	Lighting .....	5
Chief, Asst. (Division of Housing and Sanitation) .....	1,900 .....	Health .....	2
Chief Clerk .....	2,000 .....	Dir. Office, Public Safety .....	46
Chief Clerk .....	2,500 .....	Dir. Office, Public Works .....	7
Chief Clerk, Assistant (Division of Housing and Sanitation) .....	1,300 .....	Health .....	10, 65
Chief Clerk, Assistant .....	2,000 .....	Water .....	9
Chief Draftsman (Promotion) .....	1,800 .....	Water .....	104
Chief Draftsman (Sewer Plans Division) .....	2,000 .....	Surveys .....	144
Chief Engineer (Lardner's Point) .....	2,400 .....	Water .....	77, 88
Chief Engineer (Queen Lane Pumping Station) .....	1,500 .....	Water .....	86
Chief Steel Inspector (Promotion) .....	1,800 .....	City Transit .....	204
Chief, Third Assistant to .....	1,600 .....	Water .....	120
Children's Agent .....	1,350 .....	Charities .....	283
City Hall Guide .....	3.00 a day .....	City Property .....	276
City Nurse .....	900 .....	Health .....	218
Class Leader (a) Handwork for Men & Boys (Men & Women) .....	5.00 a night .....	Board of Recreation .....	291
Class Leader (c) Physical Training, Games and Dancing (Men and Women) .....	5.00 a night .....	Board of Recreation .....	291
Cleaner, Sweeper and (Men) .....	2.00 a day .....	City Property .....	242
Clerk .....	900 .....	Boiler Inspection .....	54

## INDEX.

V

POSITION	ANNUAL SALARY	DEPARTMENT OR BUREAU	PAGE
Clerk (non-competitive) . . . . .	\$1,200 . . . . .	Dir. Office, Public Safety . . . . .	40
Clerk (Men and Women) . . . . .	Less than 750 . . . . .	Any . . . . .	27
Clerk (Men) . . . . .	1,000-1,250 . . . . .	Any . . . . .	29, 31
Clerk (Men) . . . . .	1,250-1,600 . . . . .	Any . . . . .	34
Clerk (Promotion) . . . . .	900 . . . . .	Highways . . . . .	48
Clerk (Promotion) . . . . .	1,200 . . . . .	Law . . . . .	47
Clerk (Promotion) . . . . .	1,400 . . . . .	Law . . . . .	47
Clerk (Bond and Contract) . . . . .	1,400 . . . . .	Law . . . . .	69
Clerk (Bridge Division) (Prom.) . . . . .	1,000 . . . . .	Surveys . . . . .	38
Clerk (Satisfaction) . . . . .	1,200 . . . . .	Law . . . . .	69
Clerk and Accountant . . . . .	1,400 . . . . .	City Transit . . . . .	59
Clerk, Assistant . . . . .	1,000 . . . . .	Fire . . . . .	63
Clerk, Assistant in the Laboratory (Men) (Promotion) . . . . .	1,200 . . . . .	Health . . . . .	36
Clerk, Assistant Chief (Division of Housing and Sanitation) . . . . .	1,300 . . . . .	Health . . . . .	10, 65
Clerk, Assistant Chief . . . . .	2,000 . . . . .	Water . . . . .	9
Clerk, Assistant File . . . . .	900 . . . . .	Supplies . . . . .	61
Clerk and Bookkeeper (Grade Crossing Division) . . . . .	2,000 . . . . .	Surveys . . . . .	41
Clerk, Chief . . . . .	2,000 . . . . .	Dir. Office, Public Safety . . . . .	46
Clerk, Chief . . . . .	2,500 . . . . .	Dir. Office, Public Works . . . . .	7
Clerk, Contract and Estimate . . . . .	2,000 . . . . .	Surveys . . . . .	45
Clerk, Engineering . . . . .	1,000 . . . . .	W. D. & F. . . . .	57
Clerk, Estimate . . . . .	1,400 . . . . .	City Transit . . . . .	50
Clerk, Paymaster's (Promotion) . . . . .	1,100 . . . . .	Dir. Office, Public Works . . . . .	38
Clerk and Paymaster . . . . .	900 . . . . .	Charities . . . . .	11
Clerk and Paymaster, Property . . . . .	2,000 . . . . .	W. D. & F. . . . .	55
Clerk, Schedule . . . . .	1,200 . . . . .	Supplies . . . . .	52
Clerk, Stenographer and (Men and Women) . . . . .	600-900 . . . . .	Any . . . . .	14
Clerk, Stenographer and (Men) . . . . .	900-1,200 . . . . .	Any . . . . .	22
Clerk, Stenographer and . . . . .	1,200-1,500 . . . . .	Any . . . . .	24, 70
Clerk, Typewriter and (Men and Women) . . . . .	600-900 . . . . .	Any . . . . .	17
Clerk, Typewriter and (Men) . . . . .	900-1,200 . . . . .	Any . . . . .	19
Collector of Specimens . . . . .	1,000 . . . . .	Health . . . . .	288
Construction, Inspector on . . . . .	1,000-1,200 . . . . .	W. D. & F. and City Transit . . . . .	205
Construction, Inspector on . . . . .	1,200-1,500 . . . . .	W. D. & F. and City Transit . . . . .	206
Contract and Estimate Clerk . . . . .	2,000 . . . . .	Surveys . . . . .	45
Crane Runner . . . . .	3.00 a day . . . . .	Water . . . . .	90
Dentist, Assistant . . . . .	700 . . . . .	Health . . . . .	228
Detective (Promotion) . . . . .	1,700 . . . . .	Police . . . . .	183
Detective, Captain of . . . . .	2,500 . . . . .	Police . . . . .	179
Detectives, Lieutenant of (Prom.) . . . . .	2,200 . . . . .	Police . . . . .	180
Dietitian . . . . .	1,200 . . . . .	Charities . . . . .	286
Dietitian, Assistant . . . . .	900 . . . . .	Charities . . . . .	287
Director, Medical (non-comp.) . . . . .	1,800 . . . . .	Civil Service Commission . . . . .	224
Disinfector, Assistant . . . . .	1,000 . . . . .	Health . . . . .	274
District Surgeon . . . . .	Fees . . . . .	Police . . . . .	232
District Surveyor, First Asst. to . . . . .	1,200-1,400 (Inc.) . . . . .	Surveys . . . . .	122
District Surveyor, Second Asst. to . . . . .	1,000 . . . . .	Surveys . . . . .	157
Division Engineer . . . . .	2,400-2,700 (Inc.) . . . . .	City Transit . . . . .	136
Draftsman . . . . .	900-1,200 . . . . .	City Transit . . . . .	130
Draftsman . . . . .	1,000-1,200 . . . . .	City Transit . . . . .	98, 111
Draftsman . . . . .	600-900 . . . . .	Highways . . . . .	109
Draftsman . . . . .	900-1,200 . . . . .	Highways . . . . .	110
Draftsman . . . . .	1,000-1,200 . . . . .	Surveys . . . . .	155
Draftsman . . . . .	1,200-1,500 . . . . .	W. D. & F. and City Transit . . . . .	134
Draftsman . . . . .	1,500-1,800 . . . . .	W. D. & F. and City Transit . . . . .	135
Draftsman (Bridge Division) . . . . .	1,200 . . . . .	Surveys . . . . .	112
Draftsman (Sewage Disp. Div.) . . . . .	1,400 . . . . .	Surveys . . . . .	125
Draftsman, Architectural . . . . .	900-1,200 . . . . .	City Transit . . . . .	154
Draftsman, Architectural . . . . .	1,200-1,500 . . . . .	City Transit . . . . .	139
Draftsman, Architectural . . . . .	1,500-1,800 . . . . .	City Transit . . . . .	142
Draftsman, Chief (Prom.) . . . . .	1,800 . . . . .	Water . . . . .	104
Draftsman, Chief (Sewer Plans Division) . . . . .	2,000 . . . . .	Surveys . . . . .	144

## INDEX.

POSITION	ANNUAL SALARY	DEPARTMENT OR BUREAU	PAGE
Draftsman, Mechanical (Sewage Disposal)	\$1,000	Surveys	151
Draftsman, Structural	1,200-1,500 (Inc.)	Any	119
Draftsman, Structural	1,200-1,500 (Inc.)	W., D. & F.	100
Drainage Inspector, House	1,300	Health	198
Driver (Motor) (Prom.)	1,100	Fire	171
Druggist	600	Health	217
Electrical Inspector, Special	5.00 a day	City Transit	210
Electrician	3.20 a day	Any	248
Elevator Inspector	1,000-1,200	Elevator Inspection	192
Elevator Operator	2.75 a day	Electrical	246
Elevator Starter (Prom.)	3.00 a day	Electrical	277
Engineer	1,000	Charities	94
Engineer (Gas)	1,000	Surveys	81
Engineer (H. P. F. S.)	1,300	Water	85
Engineer (Pumping)	1,000-1,080	Water	83, 93
Engineer, Architectural	2,000-2,200 (Inc.)	City Transit	126
Engineer, Assistant	900	Correction	90
Engineer, Assistant	1,460	Electrical	92
Engineer, Assistant	1,800	Health	147
Engineer, Assistant	2,100	Highways	109
Engineer, Assistant	2,500	Highways	107
Engineer, Assistant (Abolishment of Grade Crossings)	2,500	Surveys	117
Engineer, Assistant (Grade Crossing Division)	1,400	Surveys	162
Engineer, Assistant Sanitary	1,500	Surveys	161
Engineer in Charge of Testing Laboratory, Assistant	3,000	Surveys	102
Engineer, Chief (Lardner's Point Pumping Station)	2,400	Water	77, 88
Engineer, Division	1,500	Water	86
Engineer in Field, Asst. (Sewage Disposal)	2,400-2,700 (Inc.)	City Transit	136
Engineer, Inspecting	1,800	Surveys	159
Engineer Inspector	1,800-2,000	City Transit	211
Engineer, Principal Assistant	2,500	Surveys	195
Engineer, Roller	4,500	Surveys	114
Engineer, Roller	100 a month	Highways	80
Engineer of Sewer Plans, Asst.	3,000	Surveys	121
Engineer, Stationary	900-1,200	Any	79
Engineer, Steam (Prom.)	1,200	Fire	170
Engineer, Steam Hoisting	3.50 a day	Water	84
Engineering Clerk	1,000	W., D. & F.	57
Estimate Clerk	1,400	City Transit	50
Estimate Clerk, Contract and	2,000	Surveys	45
Farmer (House and Found)	1,200	Charities	258
Field, Asst. Engineer in (Sewage Disposal)	1,800	Surveys	159
File Clerk, Assistant	900	Supplies	61
Filter Attendants	800	Water	244
Filters, Superintendent of	1,500	Water	233
Fireman	600-900	Any	82, 90
Fireman (Promotion)	1,100	Fire	169
Fireman on Boat	1,000	Police	91
Fire Escape Inspector	1,200	Police	213
Fire Marshal, Assistant	1,600	Police	173
First Asst. (Testing Laboratory)	1,500	Surveys	150
First Asst. Apothecary	600	Charities	217
First Asst. Bacteriologist (Men) (Promotion)	2,000	Health	225
First Asst. Resident Physician (P. H. C. D.) (Men)	1,200	Health	230
First Asst. to District Surveyor	1,200-1,400 (Inc.)	Surveys	122
Foreman	100 a month when employed	Highways	236
Foreman, Assistant	3.00 a day	Highways	234
Foreman of Laborers	3.25 a day	City Property	236
Foreman of Repairs	850	Water	235
Foreman of Sewer Repairs	100 a month	Highways	233

## INDEX.

vii

POSITION	ANNUAL SALARY	DEPARTMENT OR BUREAU	PAGE
Foreman (Unpaved Streets and Macadam Roads) . . . . .	\$100 a month . . . . .	Highways . . . . .	236
Fourth Assistant Bacteriologist (Men) . . . . .	1,000 . . . . .	Health . . . . .	226
Fresco Painter . . . . .	As per Ordinance . . . . .	City Property . . . . .	245
Guard and Sub-Guard . . . . .	800-1,000 . . . . .	Correction . . . . .	278
Guard (City Hall) . . . . .	2.50 a day . . . . .	Police . . . . .	279
Guard (Independence Hall) . . . . .	720 . . . . .	City Property . . . . .	279
Guide, City Hall . . . . .	3.00 a day . . . . .	City Property . . . . .	276
Hall, Captain of the (Men) . . . . .	600 . . . . .	Charities . . . . .	284
Head Nurse (P. H. C. D. and Diphtheria Hospital) . . . . .	900 . . . . .	Health . . . . .	229
Helper in Antitoxin Laboratory . . . . .	800 . . . . .	Health . . . . .	289
Helper, Boilermaker's . . . . .	As per Ordinance . . . . .	Any . . . . .	257
Helper, Bricklayer's . . . . .	As per Ordinance . . . . .	Any . . . . .	213
Helper, Laboratory (Technical Assistant) . . . . .	600 . . . . .	Health . . . . .	289
Helper, Machinist's . . . . .	As per Ordinance . . . . .	Any . . . . .	259
Helper, Steamfitter's . . . . .	As per Ordinance . . . . .	Any . . . . .	242
Hoisting Engineer, Steam . . . . .	3.50 a day . . . . .	Water . . . . .	84
Hoseman . . . . .	900-1,100 . . . . .	Fire . . . . .	171
House Drainage Inspector . . . . .	1,300 . . . . .	Health . . . . .	198
Hydrant Inspector . . . . .	800 . . . . .	Water . . . . .	214
Hydraulic Inspector, Mechanical & Hydraulics . . . . .	5.00 a day . . . . .	City Transit . . . . .	214
Inspecting Engineer . . . . .	1,800-2,000 . . . . .	City Transit . . . . .	211
Inspector . . . . .	1,000 . . . . .	Elevator Inspection . . . . .	210
Inspector . . . . .	1,000 . . . . .	Water . . . . .	200
Inspector . . . . .	900-1,000 . . . . .	W. D. & F. . . . .	201
Inspector (Engineering) . . . . .	100 a month when employed . . . . .	Highways . . . . .	216
Inspector, Assistant . . . . .	1,300 . . . . .	Boiler Inspection . . . . .	188, 192
Inspector, Assistant . . . . .	1,000-1,200 (Inc.) . . . . .	Health . . . . .	194
Inspector, Assistant Medical . . . . .	1,400 . . . . .	Health . . . . .	231
Inspector, Assistant Milk . . . . .	1,020 . . . . .	Health . . . . .	201
Inspector, Chief Steel (Promotion) . . . . .	1,800 . . . . .	City Transit . . . . .	204
Inspector on Construction . . . . .	1,000-1,200 . . . . .	W. D. & F. and City Transit . . . . .	205
Inspector on Construction . . . . .	1,200-1,500 . . . . .	W. D. & F. and City Transit . . . . .	206
Inspector, Elevator . . . . .	1,000-1,200 . . . . .	Elevator Inspection . . . . .	192
Inspector, Engineer . . . . .	2,500 . . . . .	Surveys . . . . .	195
Inspector, Fire Escape . . . . .	1,200 . . . . .	Police . . . . .	213
Inspector, House Drainage . . . . .	1,300 . . . . .	Health . . . . .	198
Inspector, Hydrant . . . . .	800 . . . . .	Water . . . . .	214
Inspector, Mechanical and Hydraulic . . . . .	5.00 a day . . . . .	City Transit . . . . .	214
Inspector of Meters, Assistant . . . . .	750-900 (Inc.) . . . . .	Gas . . . . .	186, 191
Inspector, Pipe . . . . .	1,000-1,200 . . . . .	Water . . . . .	185, 197
Inspector of Public Schools, Asst. Medical . . . . .	600 . . . . .	Health . . . . .	232
Inspector, Sewer (Branch Sewers) . . . . .	5.00 a day . . . . .	Any . . . . .	189, 197
Inspector, Smoke . . . . .	1,200 . . . . .	Boiler Inspection . . . . .	215
Inspector, Special . . . . .	2,500 . . . . .	Dir. Office, Public Works . . . . .	202
Inspector, Special Electrical . . . . .	5.00 a day . . . . .	City Transit . . . . .	210
Inspector, Steel . . . . .	1,500-1,800 a year or 5.00-6.00 a day . . . . .	City Transit . . . . .	190
Inspector of Test Borings (Sewage Disposal) . . . . .	1,350 . . . . .	Surveys . . . . .	208
Inspector of Test Borings, Asst. (Sewage Disposal) . . . . .	1,000 . . . . .	Surveys . . . . .	207
Installer and Repairer, Instrument Interne . . . . .	3.00 a day . . . . .	Electrical . . . . .	251
Janitor . . . . .	None . . . . .	H. & C. . . . .	220
Janitress . . . . .	720 or less . . . . .	Any . . . . .	280
Janitress . . . . .	600 or less . . . . .	Any . . . . .	263
Janitress, Assistant (non-comp.) . . . . .	600 . . . . .	Board of Recreation . . . . .	291
Laboratory Asst. (Chemical) . . . . .	900-1,000 (Inc.) . . . . .	Surveys . . . . .	265
Laboratory Asst. (Machinist) . . . . .	900-1,000 (Inc.) . . . . .	Surveys . . . . .	266

## INDEX.

POSITION	ANNUAL SALARY	DEPARTMENT OR BUREAU	PAGE
Laboratory Asst. (Physical) . . . . .	\$900-1,000 (Inc.) . . . . .	Surveys . . . . .	97, 268
Laboratory Asst. (Physical) . . . . .	1,200 . . . . .	Any . . . . .	144
Laboratory, Asst. Engineer in Charge of Testing. . . . .	3,000 . . . . .	Surveys . . . . .	102
Laboratory Helper (Technical Assistant) (Men and Women) . . . . .	600 . . . . .	Health . . . . .	289
Laboratory, Helper in Antitoxin . . . . .	800 . . . . .	Health . . . . .	289
Laborer (Oral) . . . . .	2.50 a day . . . . .	Electrical . . . . .	254
Laborers, Foreman of. . . . .	3.25 a day . . . . .	City Property . . . . .	236
Laborer, Skilled . . . . .	2.75-3.00 a day . . . . .	Electrical . . . . .	253
Lavatory Attendant . . . . .	400-480 or As per Ordinance . . . . .	Any . . . . .	280
Leader, Class (a) Handwork for men and boys (Men & Women) . . . . .	5.00 a night . . . . .	Board of Recreation . . . . .	291
Leader, Class (c) Physical Training, Games & Dancing (Men & Women) . . . . .	5.00 a night . . . . .	Board of Recreation . . . . .	291
Leader, Paver . . . . .	4.25 a day . . . . .	Highways . . . . .	253
Lieutenant (Promotion) . . . . .	1,800 . . . . .	Police . . . . .	174
Lieutenant of Detectives (Prom.) . . . . .	2,200 . . . . .	Police . . . . .	180
Lineman . . . . .	1,100 . . . . .	Electrical . . . . .	249
Machinist . . . . .	As per Ordinance . . . . .	Any . . . . .	259
Machinist's Helper . . . . .	As per Ordinance . . . . .	Any . . . . .	259
Manager . . . . .	2,750 . . . . .	Electrical . . . . .	6
Marshal, Assistant Fire. . . . .	1,600 . . . . .	Police . . . . .	173
Mechanical Draftsman (Sewage Disposal) . . . . .	1,000 . . . . .	Surveys . . . . .	151
Mechanical and Hydraulic Insp.. . . . .	5.00 a day . . . . .	City Transit . . . . .	214
Medical Director (non-comp.) . . . . .	1,800 . . . . .	Civil Service Commission . . . . .	224
Medical Inspector, Assistant . . . . .	1,400 . . . . .	Health . . . . .	231
Medical Insp. of Public Schools, Assistant . . . . .	600 . . . . .	Health . . . . .	232
Messenger . . . . .	600 . . . . .	Any . . . . .	271
Messenger . . . . .	900 . . . . .	Any . . . . .	270
Messenger (non-comp.) . . . . .	1,000 . . . . .	Dir. Office, Public Safety . . . . .	261
Meters, Assistant Inspector of. . . . .	750-900 (Inc.) . . . . .	Gas . . . . .	186, 191
Milk Inspector, Assistant. . . . .	1,020 . . . . .	Health . . . . .	201
Nurse, City . . . . .	900 . . . . .	Health . . . . .	218
Nurse, Head (P. H. C. D. and Diphtheria Hospital) . . . . .	900 . . . . .	Health . . . . .	229
Oiler . . . . .	800 . . . . .	Water . . . . .	85
Officer, Special . . . . .	720 . . . . .	W., D. & F. . . . .	288
Officer, Special . . . . .	720-900 . . . . .	Any . . . . .	279
Officer, Special . . . . .	900 . . . . .	Water . . . . .	281
Operator . . . . .	1,200 . . . . .	Electrical . . . . .	251
Operator, Elevator . . . . .	2.75 a day . . . . .	Electrical . . . . .	246
Operator, Pitometer . . . . .	3.50 a day . . . . .	Water . . . . .	106
Operator, Telephone Switchboard (Men and Women) . . . . .	900 or less . . . . .	Any . . . . .	280
Ophthalmologist, Assistant . . . . .	1,200 . . . . .	Health . . . . .	229
Outdoor Physician . . . . .	540 . . . . .	Charities . . . . .	224
Overseer . . . . .	1,200 . . . . .	Charities . . . . .	237
Painter . . . . .	As per Ordinance . . . . .	Any . . . . .	254
Painter, Fresco . . . . .	As per Ordinance . . . . .	City Property . . . . .	245
Patrolman . . . . .	2.25-3.00 a day . . . . .	Police . . . . .	176
Paymaster, Clerk and. . . . .	900 . . . . .	Charities . . . . .	11
Paymaster, Property Clerk and. . . . .	2,000 . . . . .	W., D. & F. . . . .	55
Paymaster's Clerk (Promotion) . . . . .	1,100 . . . . .	Dir. Office, Public Works . . . . .	38
Paver . . . . .	3.75 a day . . . . .	Highways . . . . .	254
Paver, Leader . . . . .	4.25 a day . . . . .	Highways . . . . .	253
Photographer, Assistant . . . . .	600-950 . . . . .	Any, except Police . . . . .	275
Physician (Philadelphia Home for Indigents) . . . . .	720 . . . . .	Charities . . . . .	228
Physician, First Assistant Resident (P. H. C. D.) (Men) . . . . .	1,200 . . . . .	Health . . . . .	230
Physician, Outdoor . . . . .	540 . . . . .	Charities . . . . .	224
Physician, Resident . . . . .	600-900 . . . . .	H. & C. . . . .	220, 223

## INDEX.

ix

POSITION	ANNUAL SALARY	DEPARTMENT OR BUREAU	PAGE
Physician, Second Assistant Resident (P. H. C. D.)	\$800	Health	229
Pilot	1,250	Police	262
Pipe Inspector	1,000-1,200	Water	185, 197
Pitometer Operator	3.50 a day	Water	106
Plumber	As per Ordinance	Any	254
Principal	1,200	Board of Recreation	294
Principal, Evening Recreation Centers (Men and Women)	5.00 a night	Board of Recreation	291
Principal, Assistant (Men and Women)	1,000	Board of Recreation	292
Principal Assistant Engineer	4,500	Surveys	114
Property Clerk and Paymaster	2,000	W. D. & F.	55
Public Schools, Assistant Medical Inspector of	600	Health	232
Pumpman	3.00 a day	Electrical	83, 93
Rammer	4.25 a day	Highways	254
Registrar (Promotion)	2,000	Surveys	44
Repairer, Instrument Installer and Repairs, Foreman of	3.00 a day	Electrical	251
Repairs, Foreman of Sewer	850	Water	235
Resident Physician	100 a month	Highways	238
Resident Physician, First Assistant (P. H. C. D.) (Men)	600-900	H. & C.	220, 223
Resident Physician, Second Asst. (P. H. C. D.)	1,200	Health	230
Rodman	800	Health	
Rodman	840-960	City Transit	105
Roller Engineer	960 or less	Any	156
Runner, Crane	100 a month	Highways	70
	3.00 a day	Water	90
Sanitary Engineer, Assistant	1,500	Surveys	161
Schedule Clerk	1,200	Supplies	52
Schools, Assistant Medical Inspector of Public	600	Health	232
Second Assistant to District Surveyor	1,000	Surveys	157
Second Assistant Resident Physician (P. H. C. D.)	800	Health	229
Second Year Apprentice	540	Electrical	256
Sergeant (Promotion)	1,200-1,400 (Inc.)	Police	181, 182
Sewer Inspector (Branch Sewers)	5.00 a day	Any	189, 197
Sewer Plans, Asst. Engineer of	3,000	Surveys	121
Sewer Repairs, Foreman of	100 a month	Highways	238
Ship Carpenter	3.50 a day	W. D. & F.	255
Skilled Laborer	2.75 & 3.00 a day	Electrical	253
Smoke Inspector	1,200	Boiler Inspection	215
Special Agent (non-comp.)	2,000	W. D. & F.	268
Special Agent and Visitor	750-1,200	Charities	285
Special Electrical Inspector	5.00 a day	City Transit	210
Special Inspector	2,500	Dir. Office, Public Works	202
Special Officer	720-900	Any	279
Special Officer	900	Water	281
Specimens, Collector of	720	W. D. & F.	288
Squad Boss	1,000	Health	288
Starter Elevator (Promotion)	2,000-2,200 (Inc.)	City Transit	140
Stationary Engineer	3.00 a day	Electrical	277
Steam Engineer (Promotion)	900-1,200	Any	79
Steam Hoisting Engineer	1,200	Fire	170
Steamfitter	3.50 a day	Water	84
Steamfitter's Helper	As per Ordinance	Any	241
Steel Inspector	As per Ordinance	Any	242
Steel Inspector, Chief (Prom.)	1,500-1,800 a year or 5.00-6.00 a day	City Transit	190
Stenographer and Clerk (Men and Women)	1,800	City Transit	204
Stenographer and Clerk (Men)	600-900	Any	14
Stenographer and Clerk	900-1,200	Any	22
Stenographer and Clerk	1,200-1,500	Any	24, 70
Storekeeper	800-1,000	Water	269
Structural Draftsman	1,200-1,500 (Inc.)	Any	119
Structural Draftsman	1,200-1,500 (Inc.)	W. D. & F.	100

## INDEX.

POSITION	ANNUAL SALARY	DEPARTMENT OR BUREAU	PAGE
Sub-Guard, Guard and . . . . .	\$800-1,000 . . . . .	Correction . . . . .	278
Superintendent, Assistant (H. P. F. S.) . . . . .	1,500 . . . . .	Water . . . . .	147
Superintendent of Filters . . . . .	1,500 . . . . .	Water . . . . .	233
Surgeon, District . . . . .	Fees . . . . .	Police . . . . .	232
Surveyor, First Assistant to District . . . . .	1,200-1,400 (Inc.) . . . . .	Surveys . . . . .	122
Surveyor, Second Assistant to District . . . . .	1,000 . . . . .	Surveys . . . . .	157
Sweeper and Cleaner (Men) . . . . .	2.00 a day . . . . .	City Property . . . . .	242
Switchboard Operator, Telephone (Men and Women) . . . . .	900 or less . . . . .	Any . . . . .	280
Telephone Switchboard Operator (Men and Women) . . . . .	900 or less . . . . .	Any . . . . .	280
Test Borings, Assistant Inspector of (Sewage Disposal) . . . . .	1,000 . . . . .	Surveys . . . . .	207
Test Borings, Insp. of (Sewage Disposal) . . . . .	1,350 . . . . .	Surveys . . . . .	208
Testing Laboratory, Assistant Engineer in Charge . . . . .	3,000 . . . . .	Surveys . . . . .	102
Third Assistant to Chief . . . . .	1,600 . . . . .	Water . . . . .	120
Tillerman (Promotion) . . . . .	1,200 . . . . .	Fire . . . . .	170
Tinsmith . . . . .	As per Ordinance . . . . .	Any . . . . .	260
Tracer . . . . .	600 or less . . . . .	Any . . . . .	152
Tracer . . . . .	600 . . . . .	City Transit . . . . .	99, 113
Transitman . . . . .	1,200-1,500 . . . . .	City Transit . . . . .	116
Typewriter and Clerk (Men and Women) . . . . .	600-900 . . . . .	Any . . . . .	17
Typewriter and Clerk (Men) . . . . .	900-1,200 . . . . .	Any . . . . .	19
Visitor, Special Agent and . . . . .	750-1,200 . . . . .	Charities . . . . .	285
Watchman (non-competitive) . . . . .	600 . . . . .	Board of Recreation . . . . .	282
Watchman (Day) . . . . .	600-800 . . . . .	Any . . . . .	264
Watchman (Independence Hall) . . . . .	720 . . . . .	City Property . . . . .	279
Watchman, Yard . . . . .	720 . . . . .	Highways . . . . .	290
Wharf Builder . . . . .	3.50 a day . . . . .	W. D. & F. . . . .	257
Wireman . . . . .	1,000 . . . . .	Electrical . . . . .	250
Yard Watchman . . . . .	720 . . . . .	Highways . . . . .	290

# EXECUTIVE SERVICE

CHIEF, BUREAU OF CITY PROPERTY, DEPARTMENT OF PUBLIC WORKS, \$4,300 a year, March 2.

*Training and Experience—Weight 3.* 1. Submit a complete statement of your general education and training, giving the names of the institutions at which you have studied, and length of attendance with dates in each case. 2. Submit a statement of any special training you have had that would tend to fit you for this position. 3. Submit a complete statement of your business or professional experience, giving the names and addresses of employers, with dates, the exact nature of your duties with each, salaries received, and reasons for making any change.

*Practical Questions—Weight 5.* 1. (*Credit=20%*). Give a short history of the City of Philadelphia, containing points on its settlement, when and by whom, its boundaries, rivers and area. Mention some of its principal public buildings, institutions and parks, giving location and a brief description or history of each. 2. (*=14%*). What would be your method of arriving at the rental value for an improved property? What do you consider the best method of renting a property that has been vacant a long period of time? What is meant by a "fire clause" in a lease? What is meant by "rent insurance"? How much insurance would you carry upon a property in comparison with its value? 3. (*=6%*). To keep real estate in good condition, suitable for renting, what percentage of valuation would you allow for repairs and renewals? 4. (*=12%*). In what cases, representing the owner, would you prefer a long-term lease, say for five or ten years, and in what a short-term lease, say for three years or less? Name some of the advantages either has over the other and give instances where such advantages would exist. In case of a lease for say ten years, mention two or more provisions you would regard as necessary to insert in the lease which would not be so important in a lease for one year. Treat this question as if you were representing a private owner instead of a municipality. 5. (*=14%*). As Chief of the Bureau of City Property you will have under your jurisdiction and control certain buildings, parks, squares, etc. To keep same in good condition and repair will require the services of superintendents, mechanics, laborers and janitors. What method would you pursue so that you could keep

informed of the general conditions and requirements of the various properties and with the work being done by the various units or departments and having them report to you as a whole? 6. (=8%). Where part of your duties is to collect interest on a mortgage belonging to the City, what course would you pursue to secure prompt payment of the interest and to protect the security of the investment? 7. (=8%). What subjects in the reports to you of the Engineer in charge of a power plant would you particularly examine and investigate with the view of increasing the efficiency and economy of the plant? 8. (=6%). How would you handle the present Municipal Court situation, in so far as it relates to the present congestion in the City Hall? Do you think the courts, other than the Municipal Courts, should be removed from the City Hall? If so, what would you think best to do with them? 9. (=6%). What would you do with the properties now being taken for the Parkway between City Hall and Logan Square? 10. (=6%). Give your views upon the proposition to erect the new Convention Hall on the Parkway.

*Personal Fitness—Weight 2.* This subject will be graded in an oral interview.

ASSISTANT CHIEF, DIVISION OF HOUSING AND SANITATION, BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$1,900 a year, March 3.

*Training and Experience—Weight 3.* 1. Give a statement of your educational training, giving names of schools attended, with location, dates of attendance, courses pursued and degree, if any, conferred. In this connection it is desired that the applicant explain any courses of reading or other special courses that he has pursued. 2. Give a statement of your employments or business or professional experience, giving names of employers, nature of work, locations, dates and reasons for changes made. It is also desired that the applicant set forth the annual income received from each employment, business or profession. 3. Give a more complete statement of any special preparation, employment, business or profession that you have had which in your opinion has direct bearing on the position for which you are being examined. 4. State any original or creative work that you have done along the lines of the duties of this position, and submit copies of any publication that you have issued, or, if impossible to do so, submit a reference list thereof. (Be careful that your name does not appear anywhere on these publications.)

*Practical Questions—Weight 5.* 1. (*Credit=10%*). Prepare a blank form for a nuisance inspector's report. 2. (*=15%*). In what form would you record the results of nuisance inspection so as to give a comprehensive view of the work accomplished? 3. (*=15%*). The Chief of the Division is away on sick leave. A tenement is reported in which two rooms, each about 10 feet by 15 feet, are occupied by a man and wife, four children and six boarders. What action would you take? 4. (*=15%*). Upon what grounds would you refuse a permit to keep a horse in the yard of a tenement house? 5. (*=10%*). A basement water closet has been ordered removed from a dwelling owing to the backing up of the sewage. The owner writes a letter of protest, saying that she is a widow of small means and cannot afford to make the change ordered. She promises to attend to the objectionable conditions as they may occur, so that they will not endanger the health of the tenants. Frame your letter in reply. 6. (*=25%*). Write a thesis of 800 words describing the duties of Assistant Chief, and also your mode of assigning work, and directing your subordinates so as to carry out the work coming under the jurisdiction of the Division of Housing and Sanitation. 7. (*=10%*). Give the general purposes of the Act of Assembly of 1915 governing the Division of Housing and Sanitation, and state its more important provisions concerning windows and lights in tenements and corridors or halls.

*Personal Fitness (Oral)—Weight 2.* This subject will be graded in an oral interview by a Board of Examiners.

CHIEF, BUREAU OF ELEVATOR INSPECTION, DEPARTMENT OF PUBLIC SAFETY, \$3,500 a year, May 2.

*Training and Experience—Weight 2.* 1. What is your age? 2. Did you attend Common School? (Yes or no.) Where did you attend Common School? How far did you go in Common School? Did you attend Grammar School? (Yes or no.) How far did you go in Grammar School? Did you attend High School? (Yes or no.) If you answer yes, state the following: Where did you attend High School? What year did you enter? What year did you leave? Did you graduate? (Yes or no.) 3. Have you attended any other educational school? (Yes or no.) If you answer yes, give below the details: 4. Have you ever worked as an elevator machinist or constructor? (Yes or no.) If you answer yes, give names and addresses of employers, char-

acter of work done, salaries received, and dates of entering and leaving each position. 5. Have you ever worked as an Elevator Inspector? (Yes or no.) If you answer yes, give details asked in fourth question. 6. Have you any other trade or occupation? (Yes or no.) If you answer yes, give details asked in fourth question. 7. Give below detailed information concerning any other work you have done not mentioned above which would tend to fit you for this position. State length of time and kind of work.

*Practical Questions—Weight 6.* 1. (*Credit=6%*). Suppose something radical in elevator design was submitted to you for approval, and you think it would be perfectly safe within certain limitations. If there was nothing specific in the existing ordinance relating to the matter, what would you do to restrict its use, and under what authority would you act? 2. (*=6%*). Suppose that an inspector brought to your notice a dangerous elevator. Assume that the owner ignored the successive orders sent him. Briefly describe each successive step you would take and how, and under what authority you would finally act to compel him to either put the elevator in good order or else discontinue its use. 3. (*=6%*). Name the things of which an itemized record should be kept in account books, index cards, forms, etc., in order that a complete record would be provided of the various activities of the Bureau. 4. (*=6%*). If there are two hydraulic passenger elevators operating in the same system, and one of these elevators is affected by the other's operation, how could this be overcome? 5. (*=6%*). (a) How would you fasten the car platform of a direct plunger hydraulic passenger elevator? (b) If the elevator is equipped with counterweights, how should the platform be further secured? 6. (*=5%*). How many square feet should be allowed in an elevator car per passenger? 7. (*=6%*). How many pounds per lineal foot should be allowed for  $\frac{5}{8}$ -inch main guide rail?

8. (*=6%*):

Size of rope	Minimum Diameter of Drum or Sheaves	Total Load Car and Contents
9.16"	?	?
5/8"	?	?
7/8"	?	?

9. (*=6%*). What factor of safety should be allowed for the following: (a) Medium Steel, pounds per square inch? (b) Cast Iron, pounds per square inch? (c) Ash or Yellow Pine,

pounds per square inch? 10. ( $=6\%$ ). How should a passenger elevator car opening be protected? 11. ( $=6\%$ ). What should the maximum voltage be for a car switch control elevator? 12. ( $=6\%$ ). From an inspector's standpoint, what would you consider the best type of cable fastening? 13. ( $=6\%$ ). Under what class should Hydro steam and pneumatic elevators come? 14. ( $=6\%$ ). (a) Where are limit switches installed? (b) How operated? 15. ( $=6\%$ ). If the elevator car should land on any object in the hatchway while descending, what would stop the cables from unwinding or untwisting? 16. ( $=6\%$ ). How many safety devices are on an electric elevator? 17. ( $=5\%$ ). What would you consider the maximum speed for a freight elevator operating hatch doors?

*Personal Fitness (Oral)—Weight 2.*

CHIEF, BUREAU OF LIGHTING, DEPARTMENT OF PUBLIC WORKS, \$2,000 a year, May 4.

*Training and Experience—Weight 2.* Any false statement made by the applicant in answering these questions will be regarded as good cause for excluding him from the eligible list, or for removal or discharge during probation or thereafter. 1. What is your age? 2. (a) In what grade were you when you left the Grammar School? (b) What High School did you attend? How long? What course? (c) What technical training have you had as apprentice, or in business school, or in college, or in technical school? 3. In general, what is your occupation? How long have you followed it? 4. When, where, for whom, and how long have you worked at this occupation, and what wages or salaries have you received in each case? 5. From what positions have you been discharged for cause, and what were the causes? 6. State exactly and in detail the kind of work you were doing in each of the leading positions you have filled. 7. Give the particulars about any special work you have done, in addition to the above, which tends to qualify you for the position you are now seeking.

*Thesis—Weight 4.* Discuss the problem of street illumination by gas and gasoline lamps as it presents itself in the City of Philadelphia. This thesis should be not less than 1,000 words in length. Sign this thesis "John Doe."

*Personal Fitness (Oral)—Weight 4.*

MANAGER, ELECTRICAL BUREAU, DEPARTMENT OF PUBLIC SAFETY, \$2,750 a year, Aug. 30.

*Training and Experience—Weight 5.* Any false statement made by the applicant in answering these questions will be regarded as good cause for excluding him from the eligible list, or for removal or discharge during probation or thereafter.

1. What is your age?
2. (a) In what grade were you when you left the Grammar School? (b) What High School did you attend? In what course of study? For what number of years? Did you graduate? State year of graduation.
- (c) Describe any technical training you have had as apprentice, in business school, in college, or in technical school, stating fully its character, the length of time spent in such training, and the purpose which led you to take it.
3. When, where, and by whom have you been employed? Place the answers in tabular form, stating the positions in the order you held them and giving the wages and salaries you received in each case.
4. From what positions have you been discharged? State the cause of discharge for each.
5. What is your present occupation or profession? For how many years have you been following it? Have you experience in any different occupation or profession?
6. Give sufficient detail about the positions you have held during the last five years to show: (a) The kind and amount of technical knowledge you have made use of; (b) The kind and amount of knowledge of filing systems and of cost accounting which you have used; (c) The kind and number of men you have had to manage.
7. What administrative problems have you been called upon to solve in the past five years?

*Practical Questions—Weight 5.* 1. (*Credit=8%*). Outline a complete organization for handling underground construction work. State the duties of each position in this organization, and explain how you would assign the men to the various positions.

2. (*=8%*). Describe in detail a system of records and accounts that would enable you to determine whether the boiler room in City Hall was being operated efficiently.

3. (*=9%*). Prepare a set of specifications for laying a 4-duct terra cotta conduit for a police patrol system on A street, between B street and C street, a distance of 2,000 feet.

4. (*=8%*). Make up a complete estimate sheet for the above work.

5. (*=8%*). Describe in detail the installations in police station houses used for police and fire signaling.

6. (*=8%*). How is an open circuit located in a fire signal system? Show the wiring diagram and explain the method

fully. 7. (=9%). Give a brief description of the fire alarm operating room. Explain the purpose of each important piece of apparatus and tell how an alarm is dispatched. 8. (=8%). Outline the system employed in testing fire alarm boxes throughout the city. Explain fully how the test is made. How frequently should each box be tested? 9. (=8%). Explain in detail the methods of installation of arc light cables for street lighting under the supervision of the Electrical Bureau. 10. (=9%). A rated motor load of 150 HP is to be taken from the switchboard of the power plant in City Hall and carried by cable a distance of 400'. Calculate the required size cable. 11. (=9%). Describe the method of preparing the annual maintenance budget of the Electrical Bureau. 12. (=8%). (a) Name the type of cable which should be used for series arc lighting on highways. (b) What is the approximate insulation resistance of this cable per mile? (c) Explain in detail how to make a breakdown test on this cable.

## **CLERICAL SERVICE**

CHIEF CLERK, DIRECTOR'S OFFICE, DEPARTMENT OF PUBLIC WORKS, \$2,500 a year, March 1.

*Training and Experience—Weight 3.* 1. Give the names and addresses of three reputable citizens who will vouch for the truth of your answers on this paper and whom we may consult, if you have not worked for any one. (See Question No. 5.) 2. What is your age? 3. Give the names and locations of the schools (Grammar, High, College or Technical) which you attended, the courses you took in each, and the date of graduation. If you did not graduate, how far did you go? 4. What is your present occupation, trade or profession? What special training have you received for it? How long did you follow it? 5. What has been your practical experience, executive or otherwise? Give names and addresses of your employers; character of their business; lengths and dates of your employments; duties of your position; salary received and reason for leaving in each case. Give these in order of time, with your present position last. Account for any time not specified on the list. 6. If you have been in business for yourself, state the nature of business, how long, and gross amount of business transacted annually.

*Bookkeeping—Weight 2.* 1. (*Credit=5%*). (a) What is an appropriation? (b) How are appropriations made by the City of Philadelphia, and in what manner is a Department or Bureau advised as to appropriations made to it? 2. ( $=10\%$ ). (a) By what method is Councils advised as to the financial needs of a Department or Bureau as to expenses for the coming year, and expenditures for permanent improvements and other purposes? (b) What are permanent improvements? 3. ( $=10\%$ ). (a) What is a purchase order? (b) What is an invoice? (c) What is a voucher? (d) Show the bearing of these documents upon the accounts and records of a City Bureau. (e) What is a requisition? (f) What class of requisitions would be used in a large Bureau? 4. ( $=15\%$ ). (a) What is the purpose of a general ledger? (b) What is the purpose of a detail ledger? (c) What detail ledgers would you consider necessary in a large Bureau of the City? (d) Give a description of them and their purpose. 5. ( $=15\%$ ). (a) What is a contract? (b) What is the method of preparing contracts? (c) How are contracts awarded? (d) How do you determine the amount available for contract in any *Item of Appropriation*? 6. ( $=10\%$ ). (a) What is an inventory? (b) Give a short description of the important accounting information given by an inventory. 7. ( $=10\%$ ). What is depreciation; in relation to property? 8. ( $=5\%$ ). What is meant by the functions or activities of a Department or Bureau? 9. ( $=15\%$ ). What financial statements would you prepare for the annual report of a large Bureau of the City? 10. ( $=5\%$ ). Into what funds are the accounts of the City divided?

*Administration—Weight 3.* NOTE:—The following questions are to be answered concisely but are limited only to the number of words necessary to a proper explanation. 1. (*Credit=15%*). What do you believe to be the best method of accounting for postage, car tickets and other evidences of value? 2. ( $=5\%$ ). Are you familiar with any mechanical devices for increasing the efficiency of office work? If so, name them. 3. ( $=15\%$ ). What would be your method of filing correspondence, documents and any other matter required to be filed by the Director's office? 4. ( $=15\%$ ). What reports of any nature would you submit to the Director and how frequently would these be made? 5. ( $=10\%$ ). What do you consider necessary reference publications as to assistance in the making of reports, etc., and in relation to the routine work of the office? 6. ( $=5\%$ ). Name the Bu-

reas under the Department of Public Works, and their account-ing and physical relations to the Director's office. 7. (=5%). Name several large public improvements now under way under the direction of the Department of Public Works. 8. (=10%). What is your authority for the preparation of a warrant, and how is it paid to the person in whose favor it is drawn? 9. (=10%). How would you arrange the incoming mail or documents received, so as to quickly dispatch the current business of the office through the proper channels? 10. (=10%). What do you consider important principles of office efficiency?

*Personal Fitness—Weight 2.* This subject will be graded in an oral interview.

ASSISTANT CHIEF CLERK, BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$2,000 a year, March 1.

*Training and Experience—Weight 2.* See examination for Chief Clerk, held March 1.

*Bookkeeping—Weight 4.* 1. (*Credit=10%*). (a) What is a purchase order? (b) What is an invoice? (c) What is a voucher? (d) What is a requisition? (e) What class of requisitions would be used in a large Bureau? 2. (=15%). (a) What is the purpose of a general ledger? (b) What is the purpose of a detail ledger? (c) How would you prove the accuracy of postings to the detail ledger? 3. (=15%). (a) What is a stores ledger? (b) From what source or document are charges made to stores? (c) What are credits to stores? (d) How would you establish the amount of stores upon the opening of a stores ledger, or the beginning of a period? 4. (=15%). (a) What is meant by expense? (b) What is an expense ledger? (c) What are the elements of expense to be recorded in expense ledger? 5. (=15%). (a) What is meant by property? (b) What is a property ledger? (c) How would you open a property ledger? 6. (=10%). (a) What is an inventory? (b) What important accounting information does an inventory give? 7. (=10%). (a) What is depreciation, in relation to property? (b) If the Bureau of Water had purchased January 1, 1890, one water tube boiler for \$12,000, the probable life of which is 20 years, what amount would be the accumulated depreciation January 1, 1916? 8. (=5%). What is your definition of the following character of expenditures: (a) Administration? (b) Operation? (c) Maintenance? 9. (=5%). Into what funds are the accounts of the Bureau or City divided?

*General Questions—Weight 2.* 1. (*Credit=10%*). State in a general way what you understand to be the government of the City of Philadelphia? 2. (=5%). Under the direction of what Department is the Bureau of Water? 3. (=20%). What is storekeeping? In a general way tell how stores are or should be handled in the Bureau of Water. 4. (=10%). What relation has the Department of Supplies to the Bureau of Water? 5. (=20%). What do you consider the proper method of accounting for postage, car tickets and other evidences of value? 6. (=15%). What are the essentials necessary before a voucher and warrant is prepared for payment? 7. (=10%). What are the physical operations of the Bureau of Water? 8. (=10%). By what is a Bureau guided in the performance of its functions?

*Personal Fitness—Weight 2.* This subject will be graded in an oral interview.

ASSISTANT CHIEF CLERK, DIVISION OF HOUSING AND SANITATION, BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$1,300 a year, March 1.

*Training and Experience—Weight 2.* See examination for Chief Clerk, held March 1.

*Bookkeeping—Weight 3.* 1. (*Credit=15%*). (a) What is an appropriation? (b) How are appropriations made? (c) When are they available to be taken on appropriation ledger? (d) What is an unexpended balance of appropriation? (e) What is an unencumbered balance of appropriation? 2. (=15%). (a) What is a contract? (b) What is the method of preparing contracts? (c) How are contracts awarded? (d) When a contract is made and properly certified to, how does it affect the appropriation item to which it is charged? 3. (=15%). (a) What is the purpose of a general ledger? (b) What is the purpose of a detail ledger? (c) How would you prove accuracy of postings to detail ledgers? 4. (=15%). (a) What is a stores ledger? (b) From what source or document are charges made to stores? (c) What are credits to stores? (d) How would you establish the amount of stores upon the opening of a stores ledger, or the beginning of a period? 5. (=15%). (a) What is meant by expense? (b) What is an expense ledger? (c) What are the elements of expense to be recorded in an expense ledger? 6. (=5%). Into what funds are the accounts of the City divided? 7. (=10%). (a) What is a requisition? (b) What classes of requisitions would

be used in the Division of Housing and Sanitation? 8. ( $=10\%$ ). What annual financial statements would you prepare for the Bureau?

*General Questions—Weight 3.* 1. (*Credit=10%*). State in a general way what you understand to be the government of the City of Philadelphia. 2. ( $=20\%$ ). What is the purpose of the Act of Assembly creating the Division of Housing and Sanitation, and state what some of its more important provisions are? 3. ( $=20\%$ ). What do you consider the proper method of accounting for postage, car tickets and other evidences of value? 4. ( $=10\%$ ). By what is a Bureau guided in the performance of its functions? 5. ( $=20\%$ ). What do you consider the best method of filing correspondence, documents and all other matter required to be filed in a City Bureau? 6. ( $=10\%$ ). How would you handle the supplies of the Division of Housing and Sanitation, and what would be your method of accounting for same? 7. ( $=10\%$ ). What books of reference or publications would be necessary for the information of the Division in the performance of its functions?

*Personal Fitness—Weight 2.* This subject will be graded in an oral interview.

CLERK AND PAYMASTER, BUREAU OF CHARITIES, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$900 a year, March 1.

*Training and Experience—Weight 2.* NOTE:—Any false statement made by the applicant in answering these questions will be regarded as good cause for excluding him from the eligible list, or for removal or discharge during probation or thereafter. 1. What is your age?....years....months. 2. Did you attend Common School? (Yes or no.) How far did you go in Common School? Did you attend Grammar School? (Yes or no.) How far did you go in Grammar School? Did you attend High School? (Yes or no.) How far did you go in High School? 3. Have you pursued any course of study in any school (business, trade or technical) since you left High School? If you have, give names of schools, dates of entering and dates of leaving, course or courses pursued, and whether you finished the course or not. 4. Have you ever been employed as a paymaster? (Yes or no.) If you have, give the names and addresses of your employers, and the dates of entering and leaving their employ. 5. By whom are you now employed? What is

his address? What is the nature of your work? When did you take your present position? 6. By whom were you employed before taking your present position? What is his address? What was the nature of your work? When did you take the position? When and why did you leave it? 7. Name any other clerical positions you have held, with names and addresses of your employers, and dates of entering and leaving their employ. Also, give any training or experience you have, not included above, which would tend to fit you for the position of Clerk and Paymaster.

*Practical Questions—Weight 2.* 1. (*Credit=20%*). Make out a pay-roll from the following time sheet, assuming an eight hour day for men paid by the day or week, with time and one-half allowed for overtime.

Day Laborers	Hours						Rate
	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	
J. H. Jones-----	8½ 7	7 8¾	10 9	6 7	7 9½	4 5	\$2.50 2.25 Rate per week \$14.00
W. F. Smith-----							
T. T. Brown-----	5	6	7	8½	4	—	

2. (*Credit=20%*). If the men on the time sheet in Question No. 1 are paid by the envelope system, explain fully how you would proceed from the time you received the time sheet until the last man was paid. 3. (=20%). What route would you map out for yourself, by ordinary means of transportation, if you were instructed to pay in the shortest possible time the employees of the Philadelphia General Hospital, the Home for Male Indigent at Holmesburg, the Home for Indigent Women at Torresdale and the Philadelphia Farms at Byberry. 4. (=20%). (a) How often does the City of Philadelphia pay its employees and in what forms? (b) What change has been introduced into the system recently and by virtue of what authority? 5. (=20%). If you paid an employee \$3 less than the sum to which he was entitled, what would be your procedure in rectifying the mistake?

*Spelling—Weight 1.* 1. admittance. 2. inspector. 3. readiness. 4. committee. 5. benefit. 6. separate. 7. commerce. 8. excellent. 9. sensitive. 10. referring. 11. muscle. 12. boundary. 13. annoyance. 14. currency. 15. divisible. 16. cashier. 17. seize. 18. height. 19. territory. 20. register.

*Copying—Weight 1.* NOTE:—Make an exact copy of the following:

### AN ORDINANCE

To make an appropriation to the Department of Recorder of Deeds, for the year 1915.

Section 1. The Select and Common Councils of the City of Philadelphia do ordain, That the sum of Two hundred and sixty-two thousand two hundred and sixty (262,260) dollars be, and the same is hereby appropriated to the Recorder of Deeds, for the year 1915, as follows:

Administration, Item 1, Personal Services; (a) Salaries: Recorder of Deeds, ten thousand dollars, \$10,000; Deputy Recorder of Deeds, four thousand dollars, \$4,000; Chief clerk, two thousand dollars, \$2,000; Bookkeeper and assistant cashier, one thousand seven hundred and fifty dollars, \$1,750; Cashier and assistant bookkeeper, one thousand two hundred dollars, \$1,200; Chief search clerk, two thousand dollars, \$2,000; Mortgage search clerks, 3 at \$1,500 each, four thousand five hundred dollars, \$4,500; Conveyance search clerks, 2 at \$1,500 each, three thousand dollars, \$3,000; Chief deed index clerk, one thousand eight hundred dollars, \$1,800; Assistant index clerks, 2 at \$1,500 each, three thousand dollars, \$3,000; Miscellaneous clerk, one thousand three hundred dollars, \$1,300; Miscellaneous clerks, 6 at \$1,200 each, seven thousand two hundred dollars, \$7,200.

*Arithmetic—Weight 2.* 1. (*Credit=20%*). A paymaster in making up a weekly pay-roll received the following list from the timekeeper: 7 bricklayers worked  $6\frac{1}{2}$  hrs. a day for 6 days at 73 cents an hour; 9 carpenters worked 8 hours a day for  $5\frac{1}{4}$  days at 51 cents an hour; 11 plumbers worked 6 days at \$3.61 a day; 4 machinists worked 6 days at \$16 a week, and one electrician worked 6 days at \$4.50 a day. Find the total amount of the pay-roll. 2. (*=20%*). A painter worked  $17\frac{1}{2}$  days, and after spending  $\frac{4}{7}$  of his wages for board had \$15 left. How much did he earn per day? 3. (*=20%*). (a) A rug is laid in a room 18 x 22 ft. 6 in. so that a 4 ft. margin of floor is left on all sides. If one pint of paint covers 75 square feet, how much paint will be required to paint the floor around the carpet? (b) It is desired to remove the rug and cover the whole floor with carpet. If the carpet, which is one yard wide, is laid lengthwise of the room, and 18 inches are wasted on every strip in matching

materials, how many yards will be required to cover the floor? 4. ( $=20\%$ ). A real estate dealer sold 2 houses for \$8,000 each, receiving for one 20% more than it cost and for the other 20% less than it cost. Did he gain or lose on the transaction and how much? 5. ( $=20\%$ ). A man invested \$16,000 in business and at the end of 9 months withdrew \$16,720, which sum included investment and gains. What rate of interest did his investment pay?

*Letter Writing*—Weight 1. Write a letter of about 200 words to Hon. William H. Kreider, Secretary, Civil Service Commission, on the subject: "The advantages and Disadvantages of the Semi-monthly Pay-roll." In grading this subject, form, ideas, grammar and expression will be considered. Sign this letter "John Doe."

*Penmanship*—Weight 1. This subject will be marked on all the written work of the examination.

STENOGRAPHER AND CLERK (Men and Women), ANY BUREAU, ANY DEPARTMENT, \$600-\$900 a year, March 8.

*Training and Experience*—Weight 1. See Questions 1, 2, 3, 5 and 6 of examination for Clerk and Paymaster, held March 1.

*Spelling*—Weight 1. 1. necessary. 2. receipts. 3. comparative. 4. minimum. 5. miscellaneous. 6. chargeable. 7. competitor. 8. aggregate. 9. possessing. 10. literally. 11. mileage. 12. sanitation. 13. community. 14. facilitate. 15. macadam. 16. foliage. 17. hydraulic. 18. sergeant. 19. reservoir. 20. ammonia.

*Arithmetic*—Weight 1. NOTE:—All work must be shown in full in solving the following problems. 1. (*Credit*=20%). Add the following numbers: 9544.12; 13211.60; 23472; 17248; 15426, and 17918, and divide by 43.29. 2. ( $=20\%$ ). A merchant bought a quantity of leather and sold 35% of it at 14 2/7% gain. The remainder he sold at 5% loss. If his net gain was \$87.50, what must have been the cost? 3. ( $=20\%$ ). Find the cost of laying an oak floor which is 18 ft. by 16 ft., if the labor and other incidentals amount to \$25 and the price of lumber is \$75 per thousand square feet? In laying the floor an allowance of 42 square feet is made for waste. 4. ( $=20\%$ ). How many common bricks are needed in building 4 walls of a structure 90 ft. long, 50 ft. wide and 60 ft. high, outside measurements, if the walls are uniformly 1 1/2 feet thick and 340 cu. ft. is allowed

on openings? A cubic foot of the wall contains an average of 22 bricks. 5. (=20%). Write out a bill for the following articles, supplying names of the consignor and consignee and making all extensions: 16 gross pens at 45 1/2 cts. a gross; 8000 envelopes at 34 1/2 cts. per gross; 130 reams of paper at \$1.32 a ream; 12 dozen files at 96 cts. a dozen; 14 dozen pencils at 62 1/2 cts. a dozen; and 18 dozen pencils at 54 2/3 cts. a dozen. What is the amount due on the bill if the articles are sold subject to a discount of 3%?

*Letter Writing—Weight 1.* Write a letter about 250 words in length to Hon. William H. Kreider, Secretary Civil Service Commission, Philadelphia, on the subject, "Profitable Reading that may be Found in a Newspaper." Grammar, style, ideas and correctness of form will be considered in grading this subject. Sign this letter "John Doe."

*Penmanship—Weight 1.* This subject will be graded on all written work of the examination.

*Stenography—Weight 4. EXERCISE I.*

Dear Sir:

In the report accompanying this letter it is suggested that improvements can be made in the method of keeping the records and handling the business of this division, and it is recommended that a committee be appointed to look into the ways and means and to devise modifications in the present Act, if necessary. It is our purpose to introduce a less complicated system of keeping records of transfers, somewhat on the order of the loose leaf ledger system, the plans being concentrated in fewer books, and the present cumbersome transfer sheets abandoned.

There will be found, in the reports of the different divisions, certain suggestions for the betterment of the service and the passage of legislation as it affects the interests of each division, all of which are heartily endorsed.

In addition to this there should be some means of conserving the time of managing officers of the Bureau, in order that the petty annoyances arising from routine correspondence and their answering of petty questions and complaints, frequently magnified, may be avoided by the delegating of more authority to the other officers in the Bureau, so that the managing officers may be able to give more time to the solution of engineering problems, the lack of which prevents satisfactory progress in advance work.

Very truly yours,

**EXERCISE II.** The wealthy citizen who is reported to have deeded for public use a handsome estate on the outskirts of Springfield, Mass., in order to assist that municipality to establish a signal fine boulevard and park system, seems to have shown a shrewd realization of one of the pressing needs of American cities. Gifts or bequests to libraries, colleges or museums are useful when they are intelligently devised. But it is well that there should be a growing understanding of the vitally important fact that money skillfully laid out in making provision for civic beautification, especially when it takes the form of parkways, boulevards and artistic and roomy open-air spaces—is likely to prove an increasingly valuable investment in the near future. However sociologists may deplore it, there is no doubt of the existence of the "drift to the cities" which tends more and more to concentrate population within their borders. Since this is the case, the obvious course for those who have the welfare of their fellow-citizens at heart is to do what they can in making cities more healthful and helpful places of abode.

*Copying—Weight 1.* Note:—Make an exact copy of the following: Nor can there be any doubt that the larger part of all these incomes is due to rent, interest and profits. Salaries and professional incomes of more than \$50,000 a year exist in a few of the larger cities, but they form a negligible proportion of the total. Salaries and professional incomes of from \$10,000 to \$50,000 are rather common. Salaries and professional fees constitute the large part of the total \$4000 to \$10,000 incomes, however, and a considerable part of the business incomes in this class also may be described as salaries, which are not paid as such only because the small capitalist is not his own employer.

Incomes from \$1000 to \$4000 are reckoned in the Congressional estimate at 5,000,000. The value of farm lands has more than doubled since 1910, and that of other farm capital has increased in almost proportion—as has also the value of farm crops. Farm lands rose in value from 13,058 to 28,457 million dollars, farm buildings from 3566 to 6325 million dollars, farm implements and machinery from 749 to 1265 million dollars, farm products from 4717 to 8694 millions. The number of farms, on the other hand, rose only from 5,737,000 to 6,361,000 (an increase of 11 per cent.), the number of farm-owners from 3,650,000 to 3,948,000 (an increase of 8 per cent.).

TYPEWRITER AND CLERK (Men and Women), ANY BUREAU,  
ANY DEPARTMENT, \$600-\$900 a year, March 9.

*Training and Experience—Weight 1.* See examination for Stenographer and Clerk, held March 8.

*Arithmetic—Weight 2.* NOTE:—EVERY PROCESS IN THE SOLUTION OF THE FOLLOWING PROBLEMS MUST BE SHOWN IN FULL. 1. (*Credit=20%*). Add the following numbers: 35264.24; 97256.42; 63673.51; 81228.75; 34513.12 and 36189.85, and divide their sum by 375.31. 2. ( $=20\%$ ). An author who wrote at a uniform daily rate produced 22140 words in  $6 \frac{3}{4}$  days. If he began a novel of 301760 words on Jan. 2, 1915, when did he finish it? 3. ( $=20\%$ ). A rectangular floor containing 288 square feet measures 12 feet in width. How long is it? If a roll of carpet is 1 yard wide and 18 inches must be allowed on every strip as waste in matching, how many yards would be used in laying the carpet lengthwise of the room? 4. ( $=20\%$ ). Of a shipment of potatoes, 10% was damaged in transit. The remainder was sold at 50 cents a bushel and brought \$364.50. How many bushels were damaged? 5. ( $=20\%$ ). (a) The simple interest on a 6% note amounted to \$86.52 in 3 years, 6 months. For what sum was the note drawn? (b) An agent charged \$433.60 for selling a consignment of fruit. If his rate of commission was  $2 \frac{1}{2}\%$ , what was the amount paid over by the man who bought the consignment?

*Spelling—Weight 1.* 1. acceptable. 2. skeleton. 3. preventative. 4. accessible. 5. arraign. 6. alliance. 7. courteous. 8. recede. 9. incessant. 10. seizure. 11. mucilage. 12. superintendent. 13. irrigate. 14. criticise. 15. subpoena. 16. acoustic. 17. monopoly. 18. comprehensible. 19. peremptory. 20. fulfill.

*Letter Writing—Weight 1.* Write a letter of about 150 words to Hon. William H. Kreider, Secretary, Civil Service Commission, Philadelphia, on the subject: "The Advantages I Derive from Philadelphia's Park System." This subject will be graded on form, ideas, style and grammar. Sign this letter "John Doe."

*Penmanship—Weight 1.* This subject will be graded on all the writing in the examination.

*Copying—Weight 4. EXERCISE I.***HANDLE SANDSTONE WITHOUT EXPLOSIVES.**

The material excavated varied from a gravelly loam to cemented gravel, glacial drift and sandstone, and the topography from a level prairie to a steep, rocky hillside, with transverse slopes of 2 1/2: 1. In the heaviest material blasting was resorted to, but in several instances the machines have dug 8 to 10 ft. of seamy sandstone without the use of explosives. About 1,500,000 cu. yds. of excavation has been handled by these two machines in two seasons.

Power consumption has varied from 0.8 to 3.0 Kw.-hr. per cubic yard of material moved, depending on the nature of the material. Outputs of 1450 cu. yds. per eight hour shift and 32,000 cu. yds. per shift per month have been obtained.

TABLE I.—EXCAVATION COSTS IN CENTS PER YARD  
WITH CLASS 24 ELECTRIC DRAG-  
LINE VALUES AT  
\$36,326.63

Item	Class 1, 333,869 cu. yd.	Class 2, 23,319 cu. yd.	Class 3, 39,045 cu. yd.
Interest on investment	0.81	1.21	2.25
Preparatory Cost	1.33	1.99	3.73
Plant depreciation	3.63	5.41	10.12
Executive	0.89	1.24	3.09
Labor	5.98	7.85	21.03
Electric Power	0.73	1.03	1.82
Supplies	1.13	1.67	6.72
Miscellaneous	0.16	0.15	0.29
TOTAL	14.66	20.55	49.05

**EXERCISE II.**

NOTE:—Arrange the following material in tabular form under appropriate headings.

TABLE I.—SUMMARY OF TIMING DATA ON CONCRETE MIXERS. TIME GIVEN IN MINUTES AND SECONDS.

Lakewood mixer, loading 0:51, unloading 0:59, actual mixing 0:11, actual total 2:02 == Koehring mixer, unloading 0:34, actual total, 1:51, loading 0:36, actual mixing 0:42 == Smith mixer, actual total 1:01, unloading 0:19, loading 0:15, actual mixing 0:25 == Foote mixer, loading 0:16, actual total 0:54, unloading

0:17, actual mixing 0:20 = Chain Belt mixer, loading 0:07, unloading 0:35, actual mixing 0:28, actual total 1:10 = Ransome mixer, unloading 0:40, loading 0:35, actual total 2:57, actual mixing 1:40 = Average, loading 0:21, actual total 1:29, unloading 0:33, actual mixing 0:28.

**TYPEWRITER AND CLERK (MEN), ANY BUREAU, ANY DEPARTMENT, \$900-\$1,200 a year, March 10.**

*Training and Experience—Weight 1.* See examination for Stenographer and Clerk, held March 8.

*Spelling—Weight 1.* 1. Hydrogen; 2. Colloquy; 3. Apparatus; 4. Increment; 5. Appraisement; 6. Oxidize; 7. Miniature; 8. Concurrence; 9. Boulevard; 10. Malign; 11. Resuscitate; 12. Officious; 13. Indemnify; 14. Inoculate; 15. Vetoed; 16. Prohibitory; 17. Purchasable; 18. Counterfeit; 19. Solicitor; 20. Vaccinate.

*Letter Writing—Weight 1.* Write a letter of about 150 words to Hon. William H. Kreider, Secretary, Civil Service Commission, Philadelphia, on the subject: "Why I Like to Read Books." This subject will be graded on form, ideas, style and grammar. Sign this letter "John Doe."

*Penmanship—Weight 1.* This subject will be graded on the writing in the entire examination.

*Arithmetic—Weight 2.* NOTE:—Every process in the solution of the following problems must be shown in full. 1. (*Credit=20%*). Add: 19,534 1/4, 21,683 2/3, 9,317 7/16, 45,156 1/2, 21,748 9/16, 16,273 7/12, 6,958 7/8, 9,372 5/6, 12,844 1/12, 7,762 5/24; divide sum by 142.21. 2. (*=20%*). What will be the cost at 19 cents a square yard for plastering the ceiling and walls of a room 48 ft. long, 27 ft. wide and 12 ft. high above the baseboard, allowance being made for 4 doors, 3 ft. wide by 7 1/2 ft. above the baseboard, and 12 windows each 3 ft. wide by 5 1/2 ft. high. 3. (*=20%*). The keeper of a general store sent 250 bushels of potatoes to a commission agent with instructions to sell them at 58 cents a bushel and invest the proceeds in hardware. If the agent charged 2% for selling the potatoes and 5% for buying the hardware, how much was invested in hardware? 4. (*=20%*). Find the date of maturity, the bank discount, and proceeds of a non-interest-bearing note \$1,800, dated Feb. 18, 1915, payable in 90 days, and discounted April 28, 1915, at 6%. 5. (*=20%*). A man erected a building at a cost of \$10,500,

which he rents at \$87.50 a month. He pays yearly taxes amounting to \$102.50; insurance, \$21.25; repairs, \$136.80, and janitor's services, \$56.95. What rate of interest does he receive on his investment?

*Copying—Weight 4.* EXERCISE 1. NOTE:—Make an exact copy of the following:

The Committee on Standard Methods of Water Analysis in its last report (1912) apparently takes this ground, although its discussion of the problem is distinctly ambiguous. In one section of the report "Recommended Procedures for Treating Samples," complete isolation and the use of the old confirmatory tests in fermentation tubes, milk, gelatin tube, peptone solution and nitrate broth are discussed. In another place it is pointed out that the entire colon group is typical of the presence of faecal matter and the following "Quantitative Test for the *B. coli* Group" is recommended:

"Add the quantities of water or sewage to be tested in dilutions by tenths, sufficient in number to obtain 40 c.c. of lactose bile, incubate at 37 degrees C. and note the production of gas. Gas often forms in a few hours when large numbers of *B. coli* are present, but the standard time for observing gas production is 48 hours. Small numbers of somewhat attenuated *B. coli* may require 3 days to form gas. Attenuated *B. coli* does not represent recent contamination and all *B. coli* not attenuated grows readily in lactose bile. No other organism except *B. welchii* gives such a test in lactose bile. *B. welchii* is of rather rare occurrence in water, is of faecal origin, is almost invariably accompanied by *B. coli*, and while the sanitary significance is the same it may, if desired, be distinguished from *B. coli* by a microscopical examination of the bile solution, when long strings of much larger bacilli than *B. coli* are seen."

EXERCISE II. NOTE:—Arrange the following material in tabular form under the appropriate headings:

LOSS DUE TO COMBUSTIBLE IN ASH

COAL LOSS DUE TO COMBUSTIBLE IN ASH AS SHOWN BY ANALYSIS  
OF SAMPLES OF COAL AND ASH FROM THE SEVERAL PLANTS  
AT LABORATORY OF THE SCRANTON ELECTRIC COMPANY,  
SCRANTON, PA.

Atlantic City plant: combustible loss, per cent, 4.43; equivalent coal loss, per cent, 4.94; estimated yearly loss, \$4,220;

saving if all equaled Newark, \$1,965 = Muncie plant: combustible loss, per cent, 10.56; equivalent coal loss, per cent, 13.76; estimated yearly loss, \$13,390; saving if all equaled Newark, \$10,820 = Scranton plant: equivalent coal loss, per cent, 10.71; combustible loss, per cent, 8.14; estimated yearly loss, \$7,120; saving if all equaled Newark, \$5,236 = Wheeling plant: saving if all equaled Newark, \$1,715; estimated yearly loss, \$3,042; equivalent coal loss, per cent, 16.10; combustible loss, per cent, 5.36 = Tiffin plant: equivalent coal loss, per cent, 9.25; combustible loss, per cent, 7.71; estimated yearly loss, \$3,760; saving if all equaled Newark, \$2,742 = Fremont plant: combustible loss, per cent, 6.99; equivalent coal loss, per cent, 8.54; estimated yearly loss, \$1,718; saving if all equaled Newark, \$1,187 = Rockford plant: saving if all equaled Newark, \$9,317; equivalent coal loss, per cent, 13.05; estimated yearly loss, \$11,860; combustible loss, per cent, 9.57 = Newark plant: combustible loss, per cent, 2.32; equivalent coal loss, per cent, 2.84; estimated yearly loss, \$433.

**EXERCISE III.** Note:—Make an exact copy of the following table, rearranging the items so that the cost column will show a descending scale of values.

ITEM	COST	COST PER K. W.
Aqueduct for water supply	\$22,971.43	\$1.149
Excavation	32,456.81	1.623
Concrete piling	32,142.04	1.607
Foundations	84,378.77	4.219
Structural	73,211.39	3.661
Building above foundations	83,004.84	4.150
Flues, dampers and gratings	34,364.27	1.718
Chimney	3,945.00	.197
Boilers and settings	90,000.12	4.500
Stokers and equipment	45,845.07	2.142
Forced draft equipment	12,108.00	.605
Economizers and induced draft equipment	36,198.00	1.810
Coal and ash-handling equipment	19,659.21	.983
Auxiliary and miscellaneous machinery	33,402.57	1.670
Turbo-generators	147,258.19	7.363

**STENOGRAPHER AND CLERK (MEN), ANY BUREAU, ANY DEPARTMENT, \$900-\$1,200 a year, March 13.**

*Training and Experience—Weight 1.* See examination for Stenographer and Clerk, held March 8.

*Spelling—Weight 1.* 1. Crystallize; 2. Cylindrical; 3. Noticeable; 4. Possession; 5. Nuisance; 6. Visible; 7. Paralysis; 8. Initiate; 9. Omission; 10. Bulletin; 11. Schedule; 12. Attorney; 13. Mercantile; 14. Confidential; 15. Hygiene; 16. Accurate; 17. Liable; 18. Register; 19. Attitude; 20. Centennial.

*Letter Writing—Weight 1.* Write a letter of about 200 words to Hon. Robert M. Griffith, President, Civil Service Commission, Philadelphia, on the subject: "The Advantages a City Derives from a Rapid Transit System." In grading this letter, style, form, grammar, and ideas expressed will be considered. Sign this letter "John Doe."

*Penmanship—Weight 1.* This subject will be graded on all the written work of the examination.

*Arithmetic—Weight 2.* NOTE:—In solving the following problems all work must be shown in full: 1. (*Credit=20%*). Add: 154,743 1/3; 312,592 5/6; 74,626 9/16; 334,274 3/4; 155,623 11/24; 97,464 5/8; 131,993 7/12; 396,869 39/48; 142,574; 219,599; 141,363, and divide by 175.75. 2. (*=20%*). A street 4,975 ft. long and 45 ft. wide was paved with asphaltum at \$2.65 per square yard. How much more would it have cost to pave it in granite blocks costing 41 cents a square foot? 3. (*=20%*). From an estate the widow received \$9,250, which was 1/3 of the whole estate. The remainder was divided among three children aged respectively 15, 12 and 10 years, and they share in proportion to their age. What per cent of the estate did each receive? 4. (*=20%*). A furniture dealer bought 12 chairs which were listed at \$10 each, and sold to him subject to trade discounts of 25% and 10%. If he disposed of them at \$45 each, what was the amount of his gain? 5. (*=20%*). A 30 day 6% interest-bearing note was discounted 10 days after it was drawn up. If the rate of discount was 6%, and the bank discount \$13.40, what was the face of the note?

*Stenography—Weight 3.* EXERCISE I. The utilizing of waste has been reduced to a science. Improvements still may be made in methods, but for all practical purposes the problem of getting the maximum profit out of refuse has been solved. The old practice of paying contractors large sums of money annually to carry

away and dump the City's refuse is giving place to the modern methods of sorting, incinerating, rendering, reducing, and finally using even the residue from these processes for fertilizing land. The city that follows this modern method places a comfortable sum to its credit at the end of each year. Here are a few items that, properly handled, mean profit: From a city of 300,000 inhabitants a utilizing plant will yield about 15,000 pounds of common paper daily, there will be large quantities of old carpets and sacks and a good percentage of woolen rags; thousands of pounds of tin cans will yield marketable quantities of solder and pure tin, melted from the sheet iron. Boston's utilizing plant has been in successful operation for nearly ten years. The disposal of waste materials is a proper municipal undertaking. The city that still sticks to the old method of throwing everything away is miles behind times. It has been estimated that there is enough value in the City's waste materials to pay for all the expense of keeping the City clean and conserving its health. Cities are rapidly coming to recognize this fact, and instead of expending enormous sums for the disposal of so-called waste products, are beginning to realize profit therefrom.

#### EXERCISE II.

Dear Sir:

In reply to your letter asking information on the City's more important operations performed during the year 1913, let me call to your attention the repaving of streets adjacent to schools with noiseless pavements. In many instances the streets about the schools in the older section of the City were paved with rough Belgian blocks, which resulted in causing considerable noise when the traffic was heavy. Contracts have been executed for replacing 44 of these pavements with wood blocks, and most of the work under these contracts has actually been performed. A few of the noiseless pavements laid about hospitals, which had been placed under contract during the year 1912, were completed in 1913. Both the schools and the hospitals where these pavements were laid are unanimous in their praise of the improvements from the stand-point of the comfort of the patients in the hospitals and the increased efficiency in school work due to the elimination of noise from the streets. Hoping the cases I have mentioned will in some measure answer your inquiries, I am,

Very truly yours,

*Copying—Weight 1.* EXERCISE I. NOTE:—Make an exact copy of the following:

While the pile driving for Dock street pier was under way, it became apparent that additional support for the piles would be required on account of the instability of the mud strata. Specifications were drawn and advertised for the deposit of heavy filling around these piles. Bids were received July 25, 1912, and contract awarded to the Delaware River Discharging Company, under Contract No. 111, dated August 6, 1912, the limit of the contract being fixed at \$30,000. The completion of this work is dependent on the substructure construction of the Dock street pier, and is as yet under way. \$7,589.44 has been paid to the contractor on account of this work.

Bulkhead construction between South street and Christian street, and between Callowhill street and Fairmount avenue and Penn street—for which Contract No. 71, dated December 2, 1911, was awarded to the Armstrong & Latta Company, the lowest bidder—has been in progress throughout the year. Work in the field was commenced January 15th in tearing out the old structure, but, owing to climatic conditions, little construction work was possible until April 15th, when pile driving was commenced north of Pier No. 41 South Wharves.

EXERCISE II. NOTE:—Arrange the following data in tabular form, under appropriate headings:

STREET CLEANING AND REMOVAL OF ASHES

First District: Contract, \$179,999; Fines, \$1,300; Disbursed, \$178,699 = Second District: Contract, \$334,000; Fines, \$765; Disbursed, \$333,235 = Third District: Contract, \$183,333; Fines, \$410; Disbursed, \$182,923 = Fourth District: Contract, \$172,000; Fines, \$625; Disbursed, \$171,375 = Fifth District: Contract, \$239,999; Fines, \$225; Disbursed, \$239,774.

STENOGRAPHER AND CLERK (MEN), ANY BUREAU, ANY DEPARTMENT, \$1,200-\$1,500 a year, March 14.

*Training and Experience—Weight 1.* See examination for Stenographer and Clerk, held March 8.

*Spelling—Weight 1.* 1. Antecedent; 2. Elliptical; 3. Necessarily; 4. Penitentiary; 5. Rescind; 6. Paraffine; 7. Synonymous; 8. Veterinary; 9. Derelict; 10. Disciplinary; 11. Annihilate; 12. Infallible; 13. Strategy; 14. Alleviate; 15. Recede; 16. Vigilant; 17. Efficiency; 18. Privilege; 19. Succumb; 20. Propriety.

*Arithmetic—Weight 1.* NOTE:—All processes used in the solution of the following problems must be shown in full. 1. (*Credit=20%*). A contractor agreed to excavate a cellar 75 ft. long, 42 ft. wide and 15 ft. deep at a cost of 15 cents a cubic yard. He also contracted to build foundation walls 18 inches thick and with outside dimensions equal to the dimensions of the excavation. If an allowance of 18 cubic yards was made for openings in the walls, and the construction was done at \$4.50 a cubic yard, what was the total amount of the bill rendered by the contractor? 2. (*=20%*). If a roll of wall paper is 8 yards long and 18 inches wide and cost 80 cents, what will be the cost of papering a ceiling 25 1/2 feet long and 17 1/2 feet wide? The paper is to be applied lengthwise of the room and 18 inches are wasted on each strip in matching the pattern. 3. (*=20%*). A real estate operator receives in rent for a building \$179 a month, and, after paying \$47.50 in taxes and \$60.50 yearly in other expenses, realizes 8 1/2% on his investment. What is the amount of his investment? 4. (*=20%*). A commission merchant received from his principal 4,800 bushels of clover seed which he disposed of at \$5.20 a bushel on 5% commission. He was instructed to invest the net proceeds in wheat, for which service he charged 4% commission. What was the total amount of his commission, and how much did he invest in wheat? 5. (*=20%*). A bill of hardware is sold with the following list prices and trade discounts: \$25.50 at 20%; \$4.50 at 20% and 25%; \$153 at 33 1/3% and 10%; \$265.50 net. If a further discount of 2% is allowed for cash, how much ready money will settle the bill?

*Letter Writing—Weight 1.* Write a letter of about 200 words to Hon. William H. Kreider, Secretary, Civil Service Commission, on the subject: "Study in Leisure Hours as a Means to Advancement." This subject will be graded on style, ideas, form and grammar. Sign this letter "John Doe."

*Penmanship—Weight 1.* This subject will be graded on the writing in the entire examination.

*Stenography—Weight 4.* EXERCISE I. Some of those who take more of human tendencies have charged the men of the present generation with a lack of the polish which characterized their forefathers. Every change in human customs or conduct so affects the progress, as well as the happiness, of the race as to deserve the careful attention of students of sociology; but if the trend of the time is really away from the old standards of courtesy, the

matter is of practical interest to everybody, and no one more than to the tradesman, whose business brings him constantly in contact with the public. This is a mercantile age, the boys of the farm are flocking to the stores of the city, the channels of business are in danger of congestion, while the fields suffer for lack of laborers. To buy and to sell to such advantage as to acquire wealth is the ambition of a large portion of our young men. Most of the old methods of trade are considered too slow, speculation is in high favor, and only the "hustler" is up to date. Is it possible that in the feverish haste for wealth with something like contempt for the leisurely and careful ways of his father, the young man has come to have too low an estimate of the value of courtesy as a business qualification? If he has and he be a salesman, his employer should look to it at once, for no amount of technical knowledge of the business can compensate for a lack of those personal qualities that are pleasing to the buyer. The shrewd Franklin when he enunciated the proverb, "Honesty is the best policy," may not have conformed to a high ethical standard, but if honesty be followed as a policy, it will become a habit, and in the meantime ethics will not suffer. So one may assume the virtue of politeness until it becomes habitual, and he will find the result a source of positive gain to his happiness and to his pocket and at the same time a gratification to those about him.

#### EXERCISE II.

Under the four cases all passengers using the various routes, and also the passenger mileage shown on statement No. 20 (with the exception of those destined to points on North Broad street line under Cases I and III, and those destined to points reached by surface transfer from North Broad street line under Cases II and IV) have been doubled, which is fairly assuming that the same return movement takes place. Statement No. 20 represents 30,043,573 passengers originating in sections through which the proposed North Broad street line operates or within the time-saving area of that line; 7,313,585 of these passengers are destined to sections outside the time-saving influence of the North Broad street line.

As a result of these comparative estimates and the study of rapid transit practice and conditions, locally and elsewhere, it was decided to recommend the use of a car about 50 feet long, 8 feet 9 inches wide, 11 feet 8 inches high and to make the clear height of the subways 12 feet from top of rail to underside of

roof; also to make the cars with longitudinal seats entirely, as the average length of ride will be comparatively short. All cars are estimated as motor cars with two 125 horsepower motors per car. The elevated lines are to be built with solid floors to conform to the best modern design. All lines are to be fully equipped with signals and all auxiliary apparatus.

*Copying—Weight 1.* Note:—Arrange the following data in tabular form under appropriate headings.

#### TABLE XI. ESTIMATED COST OF CONSTRUCTION AND EQUIPMENT OF RECOMMENDED LINES.

Line: North Broad street: construction of way and structures, \$27,877,000; equipment, \$6,034,000; real estate and easements, \$1,725,000; total, \$35,636,000. Line: South Broad street: construction of way and structures, \$5,080,000; equipment, \$1,359,000; total, \$6,439,000. Frankford line: construction of way and structures, \$5,625,000; equipment, \$2,402,000; real estate and easements, \$885,000; total, \$8,912,000. Darby line: Construction of way and structures, \$4,239,000; equipment, \$2,201,000; real estate and easements, \$151,000; total, \$6,591,000.

CLERK (Men and Women), ANY BUREAU, ANY DEPARTMENT, Less than \$750 a year, March 15.

*Training and Experience—Weight 1.* See examination for Stenographer and Clerk, held March 8.

*Spelling—Weight 2.* 1. imitate. 2. currency. 3. familiar. 4. embarrass. 5. mischievous. 6. pneumatic. 7. penetrate. 8. decisive. 9. manageable. 10. apparent. 11. assignment. 12. foliage. 13. ventilator. 14. advisable. 15. insurance. 16. wholesome. 17. scarcely. 18. relieve. 19. parliamentary. 20. accessory.

*Letter Writing—Weight 1.* Write a letter of about 150 words to Hon. William H. Kreider, Secretary, Civil Service Commission, Philadelphia, on the subject: "What can citizens do toward increasing the health and cleanliness of a city?" In grading this letter, style, form, grammar, and ideas expressed will be considered. Sign this letter "John Doe."

*Penmanship—Weight 1.* This subject will be graded on all the written work of the examination.

*Arithmetic—Weight 2.* Note:—All processes used in solving the following problems must be shown in full. 1. (*Credit=20%*). In the following statement add the columns downwards and from left to right:

Year	Armories	Water	Highways	Total
1895-1896-----	\$21498	\$59702	\$25811	
1896-1897-----	28056	119321	45583	
1897-1898-----	28056	95421	62677	
1898-1899-----	34233	75753	56864	
1899-1900-----	39364	129625	29342	
<b>Total</b>				

2. (*Credit*=20%). A merchant's cash receipts for a week were as follows: Monday, \$921.40; Tuesday, \$525.44; Wednesday, \$321.50; Thursday, \$426.60; Friday, \$929.80; Saturday, \$119.40. What was his average daily sales? 3. (=20%). A portion of a street 250 feet long and 50 feet wide is to be paved at a cost of 25 cents a square foot. What will be the total cost? 4. (=20%). Find the simple interest of \$1,250 for 4 years at 6%. 5. (=20%). Make out a bill for the following goods, supplying names for buyer and seller, making all indicated extensions and bringing down the total: 350 yards of plaids at 33 cents a yard; 248 yards of ticking at 10 cents a yard; 1,140 yards of prints at 33 cents a yard; 950 yards of lining at 25 cents a yard; 720 yards of drilling at 8 cents a yard; 2,500 yards of lining at 41 cents a yard; 250 yards of gingham at 14 cents a yard; 2,500 yards of mohair at \$1.23 a yard; 250 yards of sateen at 32 cents a yard; and 125 yards of diagonals at \$1.04 a yard.

*Copying—Weight 3.* EXERCISE I. NOTE:—Make an exact copy of the following:

In addition to this the flood peaks are charged with maximum quantities of silt and debris, and the spreading areas under these conditions soon lose their absorptive powers to a large degree. Under favorable conditions an acre of area on the boulder grounds will absorb 2 cu. ft. of water continuously. After silting, however, it will not absorb over 1 cu. ft. As a conservative matter primarily and as an adjunct to flood protection, the following streams are recommended for treatment by this system:

Name of Stream	Estimated Cost of Land	Works
San Gabriel	\$320,000	\$487,000
Tujunga	—	500,000
Tacoima	312,000	257,686
San Bemis	1,575	11,311
San Antonio	75,000	50,000

It is the intention to provide in the canons of the Verdugo watershed channels of approximately rectangular section. The sides, however, will be composed of cylinders of loose rock wrapped in heavy wire net, embedded a foot below the bottom of the channel and of sufficient diameter to give a waterway that will take care of a flow 30 to 50% in excess of the maximum observed. In the smaller streams a limiting velocity of 14 ft. per sec. was used. In the main intercepting channel this was reduced to 12 1/2 ft. per sec.

**EXERCISE II.** NOTE:—Make an exact copy of the following table, rearranging the items in order with the smallest number of samples at the top of the column and the greatest number at the foot.

	No. of samples
Surveys	1,827
Highways	3,434
Water	476
Supplies	258
Wharves, docks and ferries	51
Board of education	12
Health and charities	4
Building inspection	18
Boiler inspection	21
Electrical	12
City property	3
Public safety	7
Total	6,123

CLERK (Men), ANY BUREAU, ANY DEPARTMENT, \$1,000-\$1,250 a year, March 16.

*Training and Experience*—Weight 1. See examination for Stenographer and Clerk, held March 8.

*Spelling*—Weight 2. 1. promissory. 2. illicit. 3. discrepancy. 4. incendiary. 5. accessible. 6. courtesy. 7. rudiment. 8. pecuniary. 9. hygienic. 10. perfunctory. 11. asphalt. 12. illuminate. 13. assurance. 14. forfeit. 15. punctual. 16. creditor. 17. familiar. 18. busily. 19. vicinity. 20. illustrate.

*Arithmetic*—Weight 2. NOTE:—All processes used in solving the following problems must be shown in full. 1. (*Credit*=20%). Complete the following table by showing the totals of the columns vertically and horizontally:

					Totals
790.50	988.40	126.50	256.85	496.80	
640.18	890.50	90.18	420.62	841.92	
960.70	950.40	75.60	398.40	462.50	
490.18	960.80	214.90	425.60	521.90	
930.50	720.50	126.70	396.80	762.80	
840.15	989.72	215.20	495.65	925.54	

Totals:

2. (*Credit=20%*). If a contractor's rate for plastering is 18 cents a square yard, what is his price for plastering the walls and ceiling of a room 57 feet long, 27 feet wide and 15 feet high above the baseboard? Allowance is made for 6 doors, 4 feet 6 inches wide by 12 feet high above the baseboard, and 12 windows each 3 feet 6 inches wide by 8 feet high. 3. (*=20%*). The number of requisitions passing through an office were 15½% greater in 1915 than in 1914. How many requisitions were handled by the office in each of the years if the total for the two years was 12,068? 4. (*=20%*). (a) What is the interest on \$925 for 54 days at 6%? (b) What amount will earn \$367.44 in 9 months at 8%? (c) At what rate of interest will \$1,248 earn \$99.84 in 1 year, 4 months, if the interest is computed on a simple interest basis? 5. (*=20%*). What is the proceeds of a note for \$3,500, dated Feb. 2 and due in 4 months, without interest, if the note is discounted April 20 at 4%?

*Letter Writing—Weight 1.* Write a letter of about 200 words to Hon. Robert M. Griffith, President, Civil Service Commission, Philadelphia, on the subject: "Mechanical Devices that Add to the Efficiency of an Office." In grading this letter, form, style, grammar, and ideas expressed will be considered. Sign this letter "*John Doe*."

*Penmanship—Weight 2.* This subject will be graded on all the written work of the examination.

*Copying—Weight 2.* EXERCISE I. NOTE:—Make an exact copy of the following:

#### LIGHTING STATISTICS

The number of public lights of all kinds in use on December 31, 1913, was as follows:

Gas lamps .....	24,207
Gasoline lamps .....	19,105
Electric arc lights.....	14,619
	57,931

Of the number of electric arc lights 86 are maintained by the Board of Directors of the City Trusts, free of cost to the City, and 108 free electric arc lights are maintained by the Philadelphia Electric Company for privileges granted. One hundred twenty gas lamps are maintained by the Bureau of Correction at Tacony and Holmesburg.

The number of lamps lighted and under the immediate supervision of this Bureau on January 1, 1913, number discontinued and relocated and new lamps added during the year and total number on December 31, 1913, was as follows:

Gas lamps lighted and maintained by the U. G. I. Company, January 1, 1913.....	23,719
Relocated by the U. G. I. Company during the year.....	689
Discontinued by the U. G. I. Company during the year...	684
New gas lamps erected by the U. G. I. Company during the year .....	299

**EXERCISE II.** *NOTE:*—Copy the following selection, making all necessary corrections in spelling, grammar, punctuation and arrangement.

Fortunately for the public Good an active body of our people have not lost sight of these great commercial facility and as a result of their individual enterprise & our recognize ability as merchants, the city today possesses an important though not fully developed Foreign and Coastwise export & import trade. During the year nineteen twelve the over sea portion of this trade showed a total value of more than \$one hundred and sixty five million. This is a respectful sum in itself but it has added value from the fact that it is increase of 14,000,000 dollars over the trade of previous years.

#### SUPPLEMENTARY EXAMINATION

**CLERK (Men), ANY BUREAU, ANY DEPARTMENT, \$1,000-\$1,250 a year, March 27.**

*Training and Experience—Weight 1.* See examination for Stenographer and Clerk, held March 8.

*Spelling—Weight 2.* 1. feature. 2. saucer. 3. ambiguous. 4. caterpillar. 5. concealment. 6. nuisance. 7. peculiar. 8. irrigation. 9. authority. 10. ratio. 11. adequate. 12. proximity. 13. penetrate. 14. system. 15. aerial. 16. potential. 17. separated. 18. accessible. 19. implements. 20. crystalline.

*Arithmetic—Weight 2.* NOTE:—All processes used in solving the following problems must be shown in full. 1. (*Credit=20%*). Complete the following table by showing the totals of the columns vertically and horizontally:

					Totals
890.50	762.80	134.95	975.63	297.65	
742.89	462.50	372.83	876.92	786.29	
496.77	425.60	577.67	262.76	676.22	
545.32	392.75	698.14	321.31	213.13	
171.37	276.52	762.59	489.63	627.95	
153.45	983.76	436.87	535.79	364.78	
<hr/>					

Totals:

2. (*Credit=20%*). A room 27 feet long, 18 feet wide and 12 feet high was plastered with a rough coat and a smooth coat. The room contained 3 doors, 4 feet wide by 7 feet high, and 4 windows, 2 feet 6 inches by 5 feet. The subbase was 8 inches high. If the actual cost for the work was \$26.02 2/3 for rough coating and \$32.53 1/3 for finish coat, what was the charge per sq. yd. for each kind of plastering? 3. (*=20%*). The number of applications for entrance to a certain school in 1915 was only 93.5% of those in 1914. The total for the two years was 5,418. How many were there each year? 4. (*=20%*). A 90 day note bearing interest at 5% was signed March 2, 1916, for \$348.00. It was discounted at 6% March 18, 1916. What were the proceeds? 5. (*=20%*). A farmer sent 2,000 bushels of wheat to his commission merchant to sell. The price realized was \$1.10 per bushel. Storage and transfer charges were \$125.16. The broker's commission was 3%. The farmer asked the merchant to buy him 275 bushels of seed potatoes. The price of the potatoes was \$2.25 per bushel and the commission was 4%. The balance coming to the farmer was deposited to his order. How much was deposited.

*Letter Writing—Weight 1.* Write a letter of about 150 words to Hon. Robert M. Griffith, President, Civil Service Commission, Philadelphia, on the subject: "Methods of Filing Correspond-

ence." In grading this letter, form, style, grammar, and ideas expressed will be considered.

*Penmanship—Weight 2.* This subject will be graded on all the written work of the examination.

*Copying—Weight 2.* EXERCISE I. NOTE:—Make an exact copy of the following:

### LUBRICANTS AND LUBRICATION

Oil should be bought under specifications determined by tests, showing the quality needed for each condition. It should be tested as soon as it is received to make sure that it meets the requirements. As an illustration of what an oil test should show, the following figures are given:

### COMPARATIVE TEST OF THREE OILS

	A	B	C
Composition .....	Animal and Mineral	Animal and Mineral	Animal and Mineral
Adulterants .....	None	None	None.
Specific gravity at 82 deg. F.....	0.877	0.876	0.892
Flashing point, deg. F.....	356	374	410
Burning point, deg. F.....	410	424	446
Chill point, deg. F.....	—4	00.8	26.6
Loss at 176 deg. in 5 hr., per cent...	0.99	1.67	1.95

### COMPARATIVE VISCOSITY

Temperature	Water	A	B	C
100 deg. F.....	9.5 sec.	21.2 sec.	20.8 sec.	37.7 sec.
120 deg. F.....	9.5 sec.	17.7 sec.	17.6 sec.	27.0 sec.
176 deg. F.....	9.5 sec.	12.7 sec.	13.5 sec.	15.7 sec.

The above is the time to flow through a 3/64 in. opening of 30 c. c. of oil and water.

Distance flowed in inches down

a glass plate grade of 3.5 per cent.—time, 2 hours, 15 min. 24 1/4      24 1/4      17 3/4

Coef. of friction..... 0.0400      0.0416      0.0490

The adulterants usually added to oil are soap, caoutchouc, graphite, soapstone, barytes, free lime, chalk, starch, rosin oil and free acid. Most of these can readily be detected by any engineer by simple tests.

**EXERCISE II.** **NOTE:**—Copy the following selection, making all necessary corrections in spelling, grammar, punctuation and arrangement.

One of the most successful Insurance Sailsmen in the country have achieve his posishun thru recognition of the Human eliment in buisness. His furst step is to make friends. He ames to discover their hobbies, he endevors to find the soft sput in there harts, and then gently vury gently, play on it. He sold a \$25,000 policy to a frind of mine thru a carefully worked out heart throb campane, the center of which were my friends' nine months old Baby. He furst sent a number of cleaver title poums, linking daddy & baby & life together.

**CLERK (MEN), ANY BUREAU, ANY DEPARTMENT, \$1,250-\$1,600 a year, March 17.**

*Training and Experience—Weight 2.* See examination for Stenographer and Clerk, held March 8.

*Spelling—Weight 2.* 1. antidote. 2. surveyor. 3. acknowledgment. 4. inquisitive. 5. quarantine. 6. conscientious. 7. digestible. 8. facilitate. 9. judiciary. 10. perceive. 11. persecution. 12. assessor. 13. bankruptcy. 14. perpetrate. 15. preventative. 16. infectious. 17. visible. 18. concede. 19. affidavit. 20. utilize.

*Letter Writing—Weight 1.* Write a letter of about 200 words to Hon. William H. Kreider, Secretary, Civil Service Commission, Philadelphia, on the subject: "The Value of Habits of Economy." In grading this letter, form, style, grammar, and ideas expressed will be considered. Sign this letter "John Doe."

*Penmanship—Weight 2.* This subject will be graded on all the written work of the examination.

*Arithmetic—Weight 2.* **NOTE:**—All processes used in solving the following problems must be shown in full. 1. (*Credit =20%*). Copy the following individual ledger accounts and find the new balances. After extending the new balances add the old balances, checks, deposits and new balances in their respective columns.

Names	Balances	Checks	Deposits	Balances
Allen, E. W.....	962.59	421.65	875.90	
Briggs, C. W.....	725.42	126.42	215.95	
Comer, L. M.....	826.54	217.47	421.66	
Day, O. D.....	592.87	413.86	966.75	
Emery, E. L.....	726.88	436.58	297.52	
Foley, B. E.....	925.43	315.92	496.87	
Good, J. I.....	1426.88	413.52	575.94	
Hall, L. O.....	1217.95	687.92	726.48	
Irwin, C. E.....	924.54	241.86	926.45	
Jones, C. H.....	725.77	216.54	318.72	

2. (=20%). A will provided that  $\frac{3}{8}$  of an estate should go to the widow and the remainder so divided among 2 sons and a daughter that the elder son should receive 10% more than the younger son, who should receive 25% more than the daughter. What amount was received by each, the estate being valued at \$58,000? 3. (=20%). A rectangular bin contains 259,200 cu. ft. If the bin is 40 yds. long and 20 yds. wide, how many feet high is it? If one pint of paint covers 8 square yards, how much paint will be required to cover the floor and inside walls of the bin? 4. (=20%). What price must be asked for 1,000 pounds of coffee costing 18 cents a pound in order that the merchant may deduct 10% from the asking price for bad debts, allow  $16\frac{1}{2}\%$  loss in roasting and still make 20% profit? 5. (=20%). A merchant bought goods to the amount of \$2,376. For how much must he draw his 60-day note, without interest, that when discounted at 6% he may pay for his purchase with the proceeds?

*Copying—Weight 1.* EXERCISE I. NOTE:—Copy the following selection, making any corrections in spelling, punctuation, grammar or arrangement which you believe necessary.

the most Spectacular part off the work of maintnance of city Hall is the cleaning of same, and while \$31011 and 54 cents were saved in the cleaning and maintnence of this bilding over the ammount spent in 1912, an average of aproxamately \$100 a day, there is always room for a possible difference of opinion as to the whether results are better or not. I refrain therefor form giving a personal opinion as to the cleanliness of the Hall, but will refer to expresions made by people to the affect that it have been kept clean then ever before. Each of the savings and increases in efficiency have been brought about by scientific study and reorganization so that practicaly the same amont of work is require from each employes.

**EXERCISE II. NOTE:**—Make an exact copy of the following:

A thorough system of school inspection was put into effect in 1912, and 175,905 children in the elementary schools were examined. These inspections discovered 138,092 physical defects, which were recommended for treatment, and the records show that 45 per cent. of them were corrected. Pupils of the parochial and private schools, not heretofore inspected, are now subjected to regular examination. Ninety schools, with 54,555 pupils, were under supervision in this class. These examinations revealed 27,572 defects, of which 12,414 were remedied.

At the Eye Dispensary at City Hall, 2,363 school children were treated and 1,710 pairs of spectacles provided. At the Dental Clinic, a kindred municipal benevolence, where a regular staff is at work, 7,730 patients were treated—an average of 25.8 every day. In addition to the central clinic at City Hall, a branch dispensary was opened in Southwark School, where 2,353 patients were treated. It is proposed in the near future to open similar branches in the northeastern, northwestern and western sections of the city.

ASSISTANT CLERK IN THE LABORATORY (MEN) (PROMOTION),  
BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND  
CHARITIES, \$1,200 a year, April 14.

*Training and Experience—Weight 3.* See examination for Stenographer and Clerk, held March 8.

*Practical Questions—Weight 3.* 1. (*Credit=10%*). State in detail the work done at the Laboratory, Bureau of Health. 2. ( $=10\%$ ). Explain in what way the work at the Laboratory affects the health of the residents of Philadelphia. 3. ( $=10\%$ ). What is the relation of the Laboratory and its work to the physicians of the city? 4. ( $=10\%$ ). What do you understand by the terms: (a) Antitoxin; (b) sputum; (c) cultures; (d) serum; (e) positive or negative indications? 5. ( $=10\%$ ). Make up in proper form with complete entries a bi-weekly payroll of 20 persons for period April 1-15, 1916. 6. ( $=10\%$ ). Draw up in proper form a time sheet indicating proper entries. 7. ( $=10\%$ ). Explain how stencils are cut and how duplicator reports are run off. 8. ( $=10\%$ ). What information is included in the regular weekly reports? 9. ( $=10\%$ ). State what records are entrusted to the care of the Assistant Clerk, and tell how they should be kept so as to be easily accessible. 10. ( $=10\%$ ). Mention five

important rules or regulations of the Bureau of Health relating to the various Divisions of the Laboratory.

*Copying (on Typeewriter)—Weight 1.* NOTE:—Make an exact copy of the following:

All the sleep a child can get is so much of fortification against the inevitable stress of later years as well as conducive to his immediate vitality, comfort, and good nature. Children vary individually; often, however, the nervous child who needs the most sleep is least willing to take it. Children should ordinarily sleep as much as they want to, and should approximate the following amounts as a minimum:

THE CHILD'S APPROXIMATE AVERAGE SLEEP REQUIREMENTS		
Age	Hours of sleep.	Time in bed
12 mo--	15	6.00 P.M. to 6.00 A.M. midday nap 3 hrs.
1 to 4 yrs.	14	6.00 P.M. to 6.00 A.M. midday nap 2 hrs.
4 to 6 yrs.	13	6.00 P.M. to 6.00 A.M. 1 hr. midday rest
6 to 8 yrs.	12	7.00 P.M. to 7.00 A.M.
8 to 10 yrs.	11 ½	7.30 P.M. to 7.00 A.M.
10 to 12 yrs.	11	8.00 P.M. to 7.00 A.M.
12 to 14 yrs.	10 ½	8.30 P.M. to 7.00 A.M.
14 to 16 yrs.	10	9.00 P.M. to 7.00 A.M.
16 to 18 yrs.	9 ½	9.30 P.M. to 7.00 A.M.
18 to 20 yrs.	9	10.00 P.M. to 7.00 A.M.

Adapted and amplified from the Ninth Year Book of the National Society for the Study of Education, by permission of the author, Dr. Thomas D. Wood.

*Penmanship—Weight 1.* This subject will be marked on the entire written work of the examination.

*Arithmetic—Weight 2.* NOTE:—All processes used in the solution of the following problems must be shown in full. 1. (*Credit =20%*). Add 2,968,496; 392,945; 7,384,687; 2,948,769; 3,249,652; 1,768,478. 2. (*=20%*). On the basis of 10 hours a day, and wages at \$2.50 a day, calculate a man's pay for a month, if he worked each week as follows: 1st week,  $4\frac{1}{2}$  days; 2d week, 55 hours; 3d week,  $37\frac{1}{2}$  hours; 4th week, 46 hours. 3. (*=20%*). If his pay was increased 15% during the next month over the amount of his salary as computed in Question 2, what was the amount of the increase, and what was his pay? 4. (*=20%*). Multiply 652.5 by 2.5 and divide the product by .125. 5. (*=20%*). A Bureau spent  $\frac{1}{2}$  of its appropriation for salaries,  $\frac{1}{8}$  for supplies, and  $1/3$  for surgical instruments. The remainder

\$480, merged at the end of the year. What was the amount of the appropriation, and what amount was spent for each item?

PAYMASTER'S CLERK (PROMOTION), DIRECTOR'S OFFICE, DEPARTMENT OF PUBLIC WORKS, \$1,100 a year, April 14.

*Training and Experience—Weight 4.* See examination for Stenographer and Clerk, held March 8.

*Spelling—Weight 1.* 1. warrant. 2. voucher. 3. schedule. 4. bureau. 5. miscellaneous. 6. citizen. 7. ordinance. 8. equipment. 9. analysis. 10. graduate. 11. design. 12. technical. 13. familiar. 14. executive. 15. estimate. 16. computation. 17. engineer. 18. foundation. 19. standard. 20. knowledge.

*Penmanship—Weight 1.* This subject will be marked on the written work of the entire examination.

*Practical Questions and Arithmetic—Weight 4.* NOTE:—All processes used in solving the following problems must be shown in full. 1. (*Credit=10%*). Add: 796,856; 214,945; 685,429; 379,567; 165,924; 364,876; 817,659. 2. (*=15%*). Draw up a proper form to be used in keeping the daily time of employees of a Bureau or District, enter the names of 20 supposed employees, and supply all other information and computations required to make the sheet complete in every detail. 3. (*=12%*). Show clearly by forms or by description the differences between a time sheet and a payroll. 4. (*=15%*). Find the total amount due the following employees: 16 men, each working  $5\frac{3}{4}$  days, at \$2.75 a day; 27 men, each working  $28\frac{1}{2}$  hours, at 28 cents an hour; 35 men, each working 3 weeks, at \$12.50 a week; 12 men, each working  $37\frac{3}{4}$  hours, at \$2.50 a day (10 hours). 5. (*=8%*). What is a warrant, and tell its use. 6. (*=10%*). Give a method you would use in filing time records, etc. 7. (*=10%*). The number of men employed in a certain Department in February was 672. In March the number employed was 784. What was the increase per cent? 8. (*=10%*). A tank is  $16\frac{1}{2}$  feet long,  $8\frac{1}{3}$  feet wide, and  $5\frac{1}{4}$  feet deep. How many gallons of water will it hold if there are 231 cubic inches to a gallon? 9. (*=10%*). Describe an addressograph and tell how it is operated.

CLERK, BRIDGE DIVISION, BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS (Promotion), \$1,000 a year, April 19.

*Training and Experience—Weight 4.* See examination for Stenographer and Clerk, held March 8.

*Spelling—Weight 1.* 1. Evidence. 2. Responsible. 3. Assignment. 4. Correspondence. 5. Structures. 6. Girder. 7. Accuracy. 8. Technical. 9. Calculation. 10. Reinforced. 11. Columns. 12. Trusses. 13. Equivalent. 14. Beams. 15. Similar. 16. Symbols. 17. Diagrams. 18. Tabulate. 19. Machinery. 20. Preliminary.

*Arithmetic and Practical Questions—Weight 2.* NOTE:—All processes used in the solution of the following problems must be shown in full. 1. (=8%). Find the sum of: 297,856, 38,765, 952,478, 84,297, 685,495, 892,468, 241,875. 2. (=10%). The cost of making the excavations for the foundations of a bridge was \$78,956.25. The cost of the materials used in constructing the foundations was  $8\frac{1}{3}\%$  greater than the cost of excavation. The expense connected with the placing of the foundation materials was 12% less than the cost of making the excavations. The cost of structural steel, other materials, labor, etc., for the erection of the superstructure of the bridge was 25% greater than the total cost of the entire foundations. What was the total cost of the bridge? 3. (=8%). Perform the operations indicated:

$$\begin{aligned} & 375.45 \times 26.5 \times 2.8 \\ & 3.1416 \times 17.5 \end{aligned}$$

4. (=8%). A space 150 feet 6 inches long, 45 feet 3 inches wide, and 9 feet deep was excavated at a cost of \$1.50 a cubic yard. What was the total cost? 5. (=8%). What part of a yard is 2 feet 3 inches? 6. (=8%). How many inches are there in 5 yards, 2 feet, 5 inches? 7. (=8%). Find the simple interest of \$355.25 for 2 years, 5 months, 15 days, at 5%. 8. (=8%). Explain what kind of drawings are made and kept in the Bridge Division, Bureau of Surveys. 9. (=10%). Tell how these drawings should be filed. 10. (=8%). What data or information is turned over to the Clerk, Bridge Division, to be recorded and kept? 11. (=8%). In what form are these data recorded and kept? 12. (=8%). State in detail the nature of the work performed by the Clerk, Bridge Division.

*Letter Writing—Weight 2.* Write a letter of about 150 words to the Civil Service Commission, Philadelphia, setting forth the nature of the work done by the Bridge Division, Bureau of Surveys. Sign this letter "John Doe." Form, grammar, expression and ideas will be considered in marking this letter.

*Penmanship—Weight 1.* This subject will be marked on the written work of the entire examination.

CLERK, DIRECTOR'S OFFICE, DEPARTMENT OF PUBLIC SAFETY,  
Non-Competitive Examination, \$1,200 a year, June 7.

*Training and Experience—Weight 2.* See examination for  
Stenographer and Clerk, held March 8.

*Spelling—Weight 2.* 1. Promotion. 2. Director. 3. Bureau.  
4. Division. 5. Department. 6. Councils. 7. Chief. 8.  
Guard. 9. Discharge. 10. Position. 11. Appointment. 12.  
Information. 13. Institution. 14. Required. 15. Complete.  
16. Record. 17. Warden. 18. Employment. 19. Common.  
20. Business.

*Copying—Weight 1.* NOTE:—Make an exact copy of the fol-  
lowing:

Agents of the Pennsylvania Society for the Prevention of  
Cruelty to Animals remedied 1761 cases of cruelty without prose-  
cutions, and conducted 49 successful cases before magistrates  
during the month of May, according to a report submitted by  
Secretary Phillips at the meeting of the Board of Managers at  
the headquarters, 1627 Chestnut street, yesterday.

One hundred and five animals, including 22 horses offered for  
sale at bazaars, were killed humanely by the agents. One hun-  
dred and eighty-seven horses were ordered from labor for various  
causes, and 28 animals were moved in the society's ambulance.  
At the stock yards the agents inspected 916 carloads of cattle,  
and relieved many cases of cruelty.

*Arithmetic—Weight 1.* 1. (*Credit=20%*). Multiply the  
sum of 76,594, 892,768, 37,695, and 39,684 by 9. 2. (*=20%*).  
Add:  $1/2$ ,  $1/4$ ,  $1/8$ ,  $1/16$ . 3. (*=20%*). During the year 1914,  
16,759 persons were admitted to the House of Correction. This  
includes the number of inmates at the beginning of the year.  
During the year 11,968 persons were discharged from the institu-  
tion. How many remained at the end of the year? 4. (*=20%*).  
If each inmate costs the City 57 cents a day for maintenance, how  
much will it cost to keep 875 inmates for 35 days? 5. (*=20%*).  
Thirty thousand dollars is required to pay the salaries of 25 em-  
ployees. If all receive an equal salary, what amount does each  
receive?

*Penmanship—Weight 2.* This subject will be graded on the  
entire written work of the examination.

*Letter Writing—Weight 2.* Write a letter of about 150 words  
to the Civil Service Commission, Philadelphia, on the subject,  
"The House of Correction." Sign this letter "*John Doe*."

CLERK AND BOOKKEEPER, GRADE CROSSING DIVISION, BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS, \$2,000 a year, June 15.

*Training and Experience—Weight 4.* Any false statement made by the applicant in answering these questions will be regarded as good cause for excluding him from the eligible list or for removal or discharge during probation or thereafter.

1. What is your age?
2. Did you attend Grammar School? (Yes or no.) Were you graduated from Grammar School? (Yes or no.) If so, give date of graduation. If you were not graduated, give the date of leaving and the grade you were in when you left.
3. (a) Did you attend High School? (Yes or no.) (b) If you did attend High School, how long did you remain there and on what date (month and year) did you leave High School? (c) If you were graduated from High School, give the date (month and year) of your graduation.
4. (a) Have you pursued any course of study in school (business, trade, technical) since leaving High School? If so, give names of schools, dates of entering and dates of leaving, course or courses pursued, and whether you finished the course or not. (b) If you attended night school, give dates and tell what occupation you followed while attending night school.
5. In general, what is your occupation? How long have you followed it?
6. (a) Give the names, addresses and kind of business of all your employers. (b) State the title of the position you held under each employer, salary you received, the length of time you were employed, giving dates, and the reasons for leaving each employer.
7. From what positions have you been discharged for cause, and what were the causes?
8. State exactly and in detail the kind of work you were doing in each of the leading positions you have filled in the past five years.
9. Give the particulars about any special work you have done in addition to the above which tends to qualify you for the position you are now seeking.

*Practical Questions—Weight 6.* 1. (*Credit=15%*). Add the following and state whether debit or credit balance: (*Note to Examiner:*—Read the following figures and note as to time and accuracy of applicant.) Dr. 6,057.11, 41.20, 866.00, 3,250.00, 2,250.00, 2,450.00, 75.00, 4.25, 50.00, 150.00, 125.00, 18.28, 11.50, 1.50, 2,975.00, 15.00, 22.50, 12.60, 48.00, 157.90, 30.00, 125.00, 29.00, 125.00, 6.00, 6.18, 22.00, 82.50, 10.75, 13.89, 2,472.49, 1,558.27, 8,567.90, 343.17, 11.55, 2.40, 230.00. Cr.

48.00, 225.00, 1.05, 128.14, 7.02, 416.06, 2.40, 125.00, 125.00, 230.00, 6.18, 22.00, 157.90, 29.00, 6.00, 82.50, 10.75, 13.89, 15.00, 22.50, 12.60, 7.53, 165.94, 265.62, 2.75, 6.07, .20, 81.71, 104.50, 343.17, 21.45, 866.00, 3,250.00, 11.55, 2,250.00, 2,450.00, 75.00, 4.25, 50.00, 150.00, 125.00, 5.28, 1.50, 2,975.00, 30.00, 11.50, 402.72, 705.37, 8.86, 150.00, 3.00, 72.01, 16.67, 32.91, 10.34, 96.77, 6.13, 108.32, 3.07, 200.14, 152.83, 185.78, 25.89, 2.27. 2. (=10%). What form of bookkeeping would you use in keeping accounts on grade crossing work where railroad companies pay a portion of the cost? Give your reasons.

3. (=15%). From your method as described under Question No. 2, prepare a monthly statement of expenditures and the apportionment between A, B, C and D on the proportion of 21.25%, 21.25%, 28.75% and 28.75% on the following expenditures:

	<i>General Expenses</i>	<i>Contracts</i>	<i>Real Estate</i>
A.....	\$17,976.87	\$2,187.90	\$630.60
B.....	21,758.96	37,854.19	3,284.76
C.....	5,785.45	946.54	1,567.85
D.....	32,793.35	184,650.27	676.83

4. (=30%). (a) A certain Terminal has the following Tenant Companies: A, B, C, D and E, with the following Engines and Cars "In" and "Out" respectively. In, 8,016, 10,798, 2,983, 698 and 4,230; Out, 8,011, 10,775, 2,978, 718 and 4,218. Give the total number "In" and "Out" of each tenant and the per cent of the total of each tenant. (Carry percentage to the fourth decimal.) (b) An Engine and Coach Yard is operated jointly between A, B, C, D and E, each tenant having the following Engines and Cars, respectively: Engines, 1,708, 1,442, 375, 97 and 437; Cars, 1,096, 5,430, 1,503, 313 and 1,402. Give the total number of Engines and Cars of each tenant and the per cent of each tenant. (Carry percentage to the fourth decimal.) (c) The number of Engines and Cars of the following tenants: A, B, C, D and E, run over a certain track. North, none, 43, 2,983, 698 and 4,230; South, none, 45, 2,978, 718 and 4,218. Give the total number North and South of each tenant and the per cent of the total of each tenant. (Carry percentage to the fourth decimal.) (d) If the valuation of the Terminal, Engine and Coach Yard and Track is \$16,241,400.41, \$4,296,340.73 and \$775,412.93, respectively, what would be the amount of the rental for one month of each facility at the rate of one-third of one per cent

monthly? The taxes on the above facilities are \$5,692.73, \$1,181.94 and \$101.51, respectively, rental of equipment on the first two facilities is \$483.47 and \$102.63 and interest on bills payable on the first facility is \$1,353.33. Give the total debit of each facility, including rentals, taxes and interest, less credits account of revenues received from various sources in the amount of \$26,010.73 and \$1,264.46 for the Terminal and Engine and Coach Yard. The Operating Expenses for each facility is: Terminal, \$73,040.41; Engine and Coach Yard, \$14,910.82; and Track, \$1,029.90. Give the distribution of the costs to the Tenant Companies on the basis of the per cent as determined by 1, 2 and 3.  
NOTE:—Results to be properly tabulated.

*Practical Questions—Weight 6. 5. (Credit=30%).* Prepare a current estimate, retaining 10 per cent in favor of John Doe, 329 Market street, Philadelphia, Contract dates July 21, 1915, for grading, masonry and paving, in connection with elimination of grade crossings, from Blank street to Blank street: 19,500 cu. yds. Embankment, at \$0.14; 2,830 cu. yds. Foundation Excavation, at \$0.77; 1,920 cu. yds. Foundation Masonry, at \$2.90; 1,776 cu. yds. Concrete Retaining Wall Masonry, at \$4.10; 758 cu. yds. Concrete Abutment Masonry, at \$4.21; 190,000 ft. B. M. Timber in place, at \$48.00. Additional Work: Plant Rental, 74 hrs. Auto Truck, at \$1.25; 26 hrs. Derrick, at \$1.00; 2 hrs. Concrete Mixing and Boiling, at \$1.50; 51 hrs. Buckets, at \$0.50; 179 hrs. Dinkey Cars, at \$0.50; 81 hrs. Hoisting Engine, at \$1.25. Labor: 572 hrs. Foreman, at \$0.35; 140 hrs. Foreman, at \$0.25; 5 hrs. foreman, at \$0.45; 6,124 hrs. Labor, at \$0.17 1/2; 1,071 hrs. Labor, at \$0.18 1/2; 369 hrs. Labor, at \$0.19; 2,098 hrs. Labor, at \$0.20; 331 hrs. Labor, at \$0.25; 686 hrs. Carpenter, at \$0.35; 408 hrs. Carpenter, at \$0.40; 620 hrs. Watchman, at \$0.15; 300 hrs. Watchman, at \$0.17 1/2; 30 hrs. Watchman, at \$0.18 1/2; 20 hrs. Watchman, at \$0.20; 110 hrs. Superintendent, at \$0.75; 132 hrs. Timekeeper, at \$0.40; 81 hrs. Engineer, at \$0.41; 11 hrs. Fireman, at \$0.17 1/2; 2 hrs. Fireman, at \$0.20. Materials, \$374.82. Additional work included in this estimate, allowing 15% for materials and labor. Former payments, \$31,556.33. The amount of this estimate is to be apportioned as follows: A, 33 1/3%; B, 33 1/3%; C, 33 1/3%. Using the above, prepare a final estimate on this contract. NOTE:—Neatness, arrangement and penmanship will be considered in rating these papers.

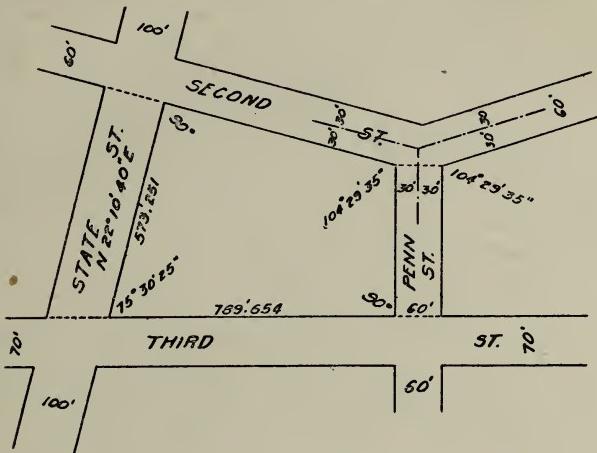
REGISTRAR, BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS (Promotion), \$2,000 a year, June 15.

*Training and Experience—Weight 3.* Any false statement made by the applicant in answering these questions will be regarded as good cause for excluding him from the eligible list, or for removal or discharge during probation or thereafter. 1. What is your age? 2. (a) In what grade were you when you left the Grammar School? (b) What High School did you attend? What course? How long? (c) What technical training have you had as apprentice, or in business school, or in college, or in technical school? 3. In general, what is your occupation? How long have you followed it? 4. When, where, for whom and how long have you worked at this occupation, and what wages or salaries have you received in each case? 5. From what positions have you been discharged for cause, and what were the causes? 6. State exactly and in detail the kind of work you were doing in each of the leading positions you have filled in the past five years. 7. Give the particulars about any special work you have done in addition to the above, which tends to qualify you for the position you are now seeking.

*Practical Questions—Weight 5.* 1. (*Credit=10%*). What are the functions of the Registry Division of the Bureau of Surveys? 2. (*=10%*). (a) Describe the methods of procedure necessary to place a street upon the confirmed City plan. (b) Name and describe the various methods of legally opening a street. 3. (*=15%*). (a). Briefly describe the system of record-keeping in use in the Registry Division of the Bureau of Surveys. (b) What are the provisions of the law relating to this record-keeping? (c) What improvements would you suggest? 4. (*=10%*). Name and describe the various methods by which a property might be registered in Philadelphia. 5. (*=10%*). In what Departments of the City, County or State government can information relative to property ownership be obtained? 6. (*=10%*). What is a "Release of Abutting Owner?" When and under what conditions are they necessary? What is the method of procedure when an owner gives a "Release" to the City of Philadelphia? 7. (*=10%*). How may old roads (not upon the confirmed City plan) be vacated? 8. (*=25%*). See blueprint. (a) Supply the missing bearings and distances. (b) Calculate the area. (c) Write descriptions for deeds of dedication of the beds of State street and Penn street, between Second street and Third street.

$$\begin{array}{lll} \text{Natural Sine for } 75^\circ 30' 25'' & = 0.96818 \\ \text{“ Cos. “ “} & = 0.25026 \\ \text{“ Tan. “ “} & = 3.86865 \end{array}$$

*Personal Fitness—Weight 2.*



**CONTRACT AND ESTIMATE CLERK, BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS, \$2,000 a year, June 20.**

*Training and Experience—Weight 4.* See examination for Clerk and Bookkeeper (Grade Crossing Division), held June 15.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). (a) What is meant by current and final estimate? (b) A District Surveyor's certificate for the completion of a branch sewer contains the following items: 500 ft. of 3' x 2' sewer, 4 manholes, 2 No. 2 B and S inlets, 1 No. 3 B and S inlet, 900 ft. of laterals, 30 ft. of vent pipe, 60 ft. of curved curb, 30 ft. of straight curb. The assessment bills amount to \$2,250. Draw a final estimate, using your own prices for the different items. State what affidavits and certificates should accompany this estimate, and why. 2. (*=10%*). (a) How are payments made for work done under contract? (b) How often are current estimates paid and what per centage retained? 3. (*=10%*). (a) What are the elements of a legal contract? What is a contract bond? What is a penal bond? (b) What is the purpose of a contract ledger? What important information relating to sewers and bridges should the contract ledger contain? What is the purpose of a contract register?

4. (=10%). (a) What is meant by liquidated damages? What is an affidavit? (b) What relation has the Department of Law to the Bureau of Surveys in the matter of contracts? 5. (=10%). (a) Give the procedure of a branch sewer contract from the opening of bids to the payment of final estimate. (b) What is the difference between a tax and an assessment? 6. (=10%). (a) What authority has the Bureau of Surveys for constructing sewers and assessing properties for same? (b) How are properties in this City assessed for sewer construction? 7. (=10%). (a) Describe the method you would use in filing and indexing contracts. (b) Describe a method for keeping account of inspectors' time. 8. (=10%). (a) Write a letter to a contractor relative to a complaint of faulty work and ordering him to remedy the faults. Sign this letter "John Doe." (b) Write a letter to a District Surveyor relative to an error in his certificate of amount of work done and the assessable frontage. Sign this letter "John Doe." 9. (=10%). (a) Give the amount of excavation for a sewer 100 feet long, 4 feet in diameter, with ring of brick 9 inches thick, 14 feet deep to inside bottom, assuming sides vertical and bottom shaped to the outside diameter of sewer. (b) Give the amount of brick work in above sewer. 10. (=10%). (a) Give the amount of lumber in the sides above the spring line, using close sheathing 3 inches thick. (For the above sewer.) (b) Give the amount of repaving with stone block over the above sewer trench and the amount of concrete for a 6-inch base.

CHIEF CLERK, DEPARTMENT OF PUBLIC SAFETY, \$2,000 a year, July 3. Non-competitive examination.

*Training and Experience—Weight 4.* See examination for Chief Clerk, held March 1.

*Practical Questions—Weight 6.* 1. (*Credit=20%*). Outline a modern system of filing, keeping and controlling correspondence and other public documents of record. 2. (=20%). Outline a comprehensive system of keeping the accounts of the Department of Public Safety so that at any time they would show all the facts desired by Bureaus. 3. (=20%). Outline the orderly procedure of entering into a contract from the time of its authorization by ordinance of Councils until the work is completed. 4. (=20%). Discuss your method of procedure in assembling and arranging the material for the Annual Report of

the Department. 5. (=20%). Write a letter of about 1,000 words, outlining the work to be performed by the Chief Clerk, Department of Public Safety, its scope, etc., and what should be his part in increasing the general efficiency of the office.

CLERK (PROMOTION), DEPARTMENT OF LAW, \$1,200 a year, July 10.

*Training and Experience—Weight 5.* See examination for Stenographer and Clerk, held March 8.

*Practical Questions—Weight 5.* 1. (*Credit=10%*). Give an outline of the procedure on a tax lien from the beginning to judgment and judgment of revival and Sheriff sale thereon, the different writs and forms used, and the clerical work connected therewith. 2. (=10%). How many different forms of affidavits of service of ten-day notices are there and when should each one be used? 3. (=10%). To obtain a valid judgment sur claim under the Act of 1824 and its various supplements, what should the Sheriff's return to a writ of Sci. Fa. set forth, where there is no registered owner, where there is a registered owner, where the property is vacant, where it is occupied, where personal service can be made and where it cannot be? 4. (=10%). Under the Act of 1824 and its supplements, what are proper Sheriff returns to writs of Sci. Fa. to revive and what are the two kinds of judgments taken? 5. (=10%). What tax liens are proceeded with under the Act of June 4, 1901, and its supplements? 6. (=10%). What should the Sheriff's return set forth on a Sci. Fa. sur claim under the Act of 1901 (a) where personal service thereof can be made, (b) where personal service cannot be made? 7. (=10%). What is the difference in advertising between the Act of 1824 and the Act of 1901 and in return days? 8. (=10%). How were Sci Fas. to revive judgments served under the Act of 1901 prior to the amending Act of 1915, and what service is permissible since then? 9. (=10%). What kinds of judgments were taken on a Sci. Fa. sur claim under the Act of 1824, and what on a Sci. Fa. sur claim under the Act of 1901? 10. (=10%). What is meant by a suggestion of default? What is its purpose, and in what tax lien cases can it be used?

CLERK, DEPARTMENT OF LAW (PROMOTION), \$1,400 a year, July 28.

*Training and Experience—Weight 4.* See examination for Stenographer and Clerk, held March 8.

*Practical Questions—Weight 3.* 1. (*Credit=8%*). What is a contract? Wherein does a Municipal Contract differ from contracts between private parties? 2. ( $=7\%$ ). What Acts of Assembly govern Municipal Contracts? 3. ( $=8\%$ ). What are the nature and character of bonds required to accompany a Municipal Contract? 4. ( $=7\%$ ). What contracts require a penal bond to accompany them? 5. ( $=7\%$ ). What is the authority for requiring penal bonds on contracts? 6. ( $=7\%$ ). What contracts can bonds be dispensed with? 7. ( $=7\%$ ). What is required in lieu of the bond where it can be dispensed with? 8. ( $=7\%$ ). What is necessary to be done regarding the award of the contract, and what is required to be done leading to the consummation of a Municipal Contract? 9. ( $=7\%$ ). What are the various forms of bonds and contracts used in the Department of Law? Give the names of same. 10. ( $=7\%$ ). Why is the Mayor required to execute bonds on behalf of the City? 11. ( $=7\%$ ). Can you give the names of the various City Departments and Bureaus attached thereto? 12. ( $=7\%$ ). Can an oral contract be made by the City or its officials, and give the reason therefor? 13. ( $=7\%$ ). Can you name the county offices in the City of Philadelphia? 14. ( $=7\%$ ). What is the date of the Consolidation Act?

*Spelling—Weight 1.* 1. Nuisance. 2. Abatement. 3. Demurrer. 4. Extenuation. 5. Felon. 6. Beneficiary. 7. Settlement. 8. Insolvency. 9. Habeas Corpus. 10. Judicial. 11. Liability. 12. Mortgage. 13. Injunction. 14. Forbearance. 15. Opinion. 16. Abrogation. 17. Principal (an agent). 18. Testimony. 19. Infringement. 20. Provocation.

*Letter Writing—Weight 1.* Write a letter of about 200 words to the Civil Service Commission on the work of the Office of the City Solicitor.

*Penmanship—Weight 1.* This subject will be graded on the writing in the entire examination.

CLERK, BUREAU OF HIGHWAYS, DEPARTMENT OF PUBLIC WORKS (PROMOTION), \$900 a year, August 30.

*Training and Experience—Weight 3.* 1. What is your age? ....years....months. 2. Did you attend Grammar School? (Yes or no.) How far did you go in Grammar School? Did you attend High School? (Yes or no.) What course did you take in High School? How far did you go in High School? What courses of study have you pursued in evening school, business col-

lege, or other institution? 3. How long have you been employed in the Bureau of Highways?....years....months. State the positions you have held under the Bureau, with the salary of each position. 4. Outside of your employment by the Bureau of Highways, what positions have you held as clerk, stenographer or book-keeper? Give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 5. What other experience or training have you had which would fit you for this position?

*Arithmetic—Weight 2.* 1. (*Credit=20%*). Add the following: 782; 854; 1,132; 1,276; 852; 2,120; 378; 1,995; 2,144; 467. 2. ( $=20\%$ ). (a) Add  $1/3$ ,  $1/6$  and  $3/4$ . (b) Subtract  $2/3$  from  $7/8$ . 3. ( $=20\%$ ). (a) Multiply 325.5 by 27.75. (b) Divide 458.275 by 37.5. 4. ( $=20\%$ ). If 30 bricks are required to pave a square yard of street surface, how many bricks will be required to pave a street 36 feet wide and 360 feet long? 5. ( $=20\%$ ). A highway engineer found that a brick pavement with a concrete foundation could be laid for \$1.50 a square yard, and that a brick pavement without a concrete foundation could be laid for 50 cents a square yard. (a) What would it cost to pave a street 18 feet wide and 300 feet long, using a concrete foundation? (b) How much will it cost to pave the street if the concrete foundation is left out?

*Spelling—Weight 1.* 1. Asphalt. 2. Cement. 3. Maintenance. 4. Gravel. 5. Material. 6. Expenditure. 7. Minimum. 8. Representative. 9. Descend. 10. Administration. 11. Permissible. 12. Locality. 13. Consistency. 14. Relative. 15. Development. 16. Drainage. 17. Municipal. 18. Permanent. 19. Assessment. 20. Indemnify.

*Letter Writing—Weight 1.* Write a letter of about 200 words on the subject: "Why Every Citizen Should Help in Keeping the Streets Clean." Address the letter to Hon. William H. Kreider, Secretary, Civil Service Commission, Philadelphia. Sign this letter "John Doe."

*Penmanship—Weight 1.* This subject will be marked on all the written work of this examination.

*Copying—Weight 2.* EXERCISE I. NOTE:—Make an exact copy of the following:

During the past ten years the advent of the motor truck has introduced new problems to those in charge of street and highway management. There have been large and special types of horse-

drawn vehicles in existence for many years, such as trucks for hauling steel girders and columns, printing presses, boilers and other heavy materials through the streets. Steam traction engines have also existed for many years, and are occasionally to be met with on country highways. These heavy vehicles, however, are not very numerous and their effect upon the pavements is not very great, owing to their slow speed and the care taken by owners and drivers not to cause unnecessary damage.

The advent of the motor truck has introduced new features into the problem, however, as there has been a marked tendency on the part of the manufacturers of these vehicles to increase their loading capacity and speed. It is self-evident that the cost of hauling can be greatly reduced if the size of the vehicle is increased, since the cost per ton hauled for fuel, wages and other items is reduced. The proposition from the standpoint of the manufacturer and the owner of motor trucks is of course to get the greatest return in hauling capacity for the investment and cost of operation and maintenance.

**EXERCISE II.** **NOTE:**—Copy the following exercise in tabular form, re-arranging the items in alphabetical form:

Management .....	\$0.995	\$0.491
Superintendence .....	4.590	2.265
Depreciation .....	8.440	4.985
Sinking fund .....	5.200	3.180
Interest .....	20.400	15.970
Insurance .....	0.379	0.615
Taxes .....	1.313	0.803
Fuel .....	2.615	2.410
Oil, waste and packing .....	0.775	0.126
Pumping-station wages .....	7.490	6.210
Machinery repairs and building .....	0.432	0.072
Miscellaneous expenses .....	0.322	0.133

**ESTIMATE CLERK, DEPARTMENT OF CITY TRANSIT, \$1,400 a year, August 30.**

*Training and Experience—Weight 4.* For questions 1 to 5, see questions 1, 2, 3, 5 and 6, examination for Clerk and Paymaster, held March 1. 6. Name any other positions you have held, with names and addresses of your employers, salaries received, and dates of entering and leaving, and reasons for leaving their employ. Also give any training or experience you have not

included above which would tend to fit you for this position.  
7. Have you had any experience in handling contract and estimate accounts? (Yes or no.) If so, give the names and addresses of your employers, dates of entering and leaving, salaries received, and reasons for leaving their employ. 8. Are you familiar with the operation and use of calculating machines. (Yes or no.) If so, state the names of the machines, and the nature of the calculations.

*Practical Questions—Weight 6. (Credit=5%).* (a) Define: fabricated material; raw material. (b) What allowance is generally made for raw material in estimates for contract payments? 2. (=5%). What is the weight of: (a) A bag of cement; (b) a cubic yard of broken stone; (c) a cubic yard of sand? 3. (=10%). Describe the form and nature of affidavits which must accompany estimates for contract payments, explaining the reason for this procedure. 4. (=10%). (a) In a lump sum contract, what is meant by unit price items? (b) Explain the application of such items with regard to increases or decreases in quantities covered by the lump sum bid. 5. (=10%). Attach current values to each of these classes of labor and material: Mechanics, bricklayers, carpenters, blacksmiths, electricians, plumbers, timbermen; cement, sand, brick, broken stone, steel, lumber, expanded metal. 6. (=5%). Write a letter to a contractor ordering placement of additional work and prescribing method of payment; also to a newly assigned inspector, containing detailed instructions for his guidance. Sign both "*John Doe*." 7. (=15%). Describe in detail a method which might be employed in checking and reporting upon additional labor and material ordered from a contractor, explaining what safeguards you would introduce to avoid errors and to locate responsibility. How should such records be tabulated for submission in connection with field returns for contract payments? 8. (=5%). Describe the various calculating machines with which you are familiar, explaining which machines are best suited to the different classes of computations ordinarily met with. 9. (=15%). Outline a method for keeping accurate record of elapsed working time upon a contract which is subject to a daily charge for engineering and supervision expense; also a system for the recording and reporting of time for inspectors paid on a per diem basis, it being necessary to apportion the inspection cost against each of the construction sections. 10. (=20%). The lump sum price for the

construction of a sewer in "X" street, from "A" street to "B" street, is \$455,667.00; on August 15, 1916, it is estimated that the contractor has completed 55.34% of the work, the elapsed working time at this date being 274 days to be charged against the contract price at the rate of \$45.00 per day to cover the cost of engineering and supervision; the following additional items have been ordered under the contract and certain minor portions of the work called for by the contract plans have been omitted by order:

Additional Items.		Work omitted.
154.7 cu. yds.	Excavation	175.6 lin. ft. 6" Vit.
34.4 "	Brick Masonry	Clay Pipe
15.3 "	Concrete Masonry	23.3 lin. ft. 8" Vit.
4,334.0 pounds	Steel Work	Clay Pipe
1,753.0 ft. B. M.	Yellow Pine Lumber	76.2 cu. yds. Rubble
115.4 lin. ft.	Straight Curb	Masonry
78.2 sq. yds.	Granite Block Repaving	15.8 sq. yds. Brick
\$785.53	Force Account (net)	Repaving

Prepare complete field return for the above, to be known as Current Estimate No. 3; also prepare estimate in proper form to show amount of payment due the contractor, based upon the quantities and details given, supplying your own prices for the several items not covered by the lump sum bid and retaining 10% of the uncompleted portion of the work. Former payments amounted to \$110,593.45.

SCHEDULE CLERK, DEPARTMENT OF SUPPLIES, \$1,200 a year, August 31.

*Training and Experience—Weight 2.* For Questions 1, 2 and 5, see Questions 1, 2 and 5, examination for Clerk, Highways, held August 30.

3. How long have you been employed in the Department of Supplies?....years....months. State the positions you have held under the Department with the salary of each position. 4. Outside of your employment by the Department of Supplies, what positions have you held as clerk, stenographer or bookkeeper? Give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position.

*Spelling—Weight 1.* 1. Sanitary. 2. Stationery. 3. Miscellaneous. 4. Tonnage. 5. Accessories. 6. Implement. 7. Inspector. 8. Issuance. 9. Approximately. 10. Responsible. 11.

Dissatisfaction. 12. Compliance. 13. Annoyance. 14. Deficiency. 15. Authorization. 16. Appropriation. 17. Commencement. 18. Magnitude. 19. Commodity. 20. Verification.

*Practical Questions—Weight 3.* 1. (*Credit=20%*). Explain in detail the method of preparing a schedule of bids. 2. (*=20%*). Assuming any data that you desire, prepare schedules of bids for the following supplies: packing, lubricating oils, and greases. Give any information that may be of value to the Director of Supplies in awarding the contracts. 3. (*=30%*). What factors should be considered in awarding contracts for: (a) coal; (b) packing; (c) lubricating oils; (d) forage; (e) groceries and provisions; (f) hardware and tools? 4. (*=20%*). Quote the market prices on 3 (a), (b), (c), (d), flour, rice, potatoes, onions, 1/2" American coil straight link chain, 1" galvanized wire nails. 5. (*=10%*). (a) Is it always desirable to award a contract to the lowest bidder? (b) Give the reasons for your answer.

*Letter Writing—Weight 1.* Assuming any data that you desire, write a 150 word letter to a bidder rejecting his bid. Sign this letter "John Doe." The form, as well as the subject matter, will be considered in grading this letter.

*Penmanship—Weight 1.* Your penmanship will be graded on the execution of the above letter.

*Arithmetic—Weight 2.* 1. (*Credit=15%*). Find the extensions and total amount of the following bill: 4 doz. umbrellas, @ \$2.25 each; 1 gross hats, @ \$2.50 each; 60 prs. gloves, @ \$3.00; 2 pcs. cassimere, 63 yds., @ \$1.75; 1 pc. Irish linen, 18 yd., @ \$.65. 2. (*=15%*). Arrange a schedule for the following bids: A bids \$1,435, less 5% in 30 days; B bids \$1,390, less 3% in 30 days; C bids \$1,575, less 10% and 5% in 30 days. 3. (*=25%*). How many yards of carpet, 3/4 yd. wide, should you order to cover a floor 14 ft. wide and 27 ft. 9 in. long, if you allow 6 in. for matching? 4. (*=20%*). A commission merchant sold a consignment of cotton for \$4,500, receiving in payment a note, which yielded, on being discounted at 6%, \$4,477.50; what was the time of the note? 5. (*=25%*). Compute the cost of the following timber at \$37 per M ft. B. M.:

No. of pieces	Sizes
125	3" x 4" x 16'-0"
430	7/8" x 8" x 12'-0"
58	12" x 12" x 16'-0"

CLERK, BUREAU OF BOILER INSPECTION, DEPARTMENT OF PUBLIC SAFETY, \$900 a year, October 23.

*Training and Experience—Weight 2.* See examination for Stenographer and Clerk, held March 8.

*Practical Questions—Weight 5.* 1. (*Credit=10%*). Add: 13,456.75; 321.025; 6,723; 90,412.; 1,121.56; 43,215.756; 905,134.5; 11,445,612.12; 4,605. 2. (*=10%*). Divide 77,517.88 by 16.4. 3. (*=10%*). (a) Subtract  $7\frac{7}{8}$  from  $8\frac{5}{6}$ . (b) Multiply  $3\frac{2}{3}$  by  $6\frac{5}{4}$ . 4. (*=10%*). What is the area of a circular grate measuring 3 feet, 6 inches in diameter? 5. (*=10%*). What is the rating for insurance company charges on a horizontal tubular boiler which has 20 square feet of grade surface under it? 6. (*=10%*). In a pile of scrap iron there are 15 rusted grates and 22 broken grates. What percentage of the whole pile of grates is represented by the rusted grates? 7. (*=10%*). In making out your bills for the boilers inspected by the City of Philadelphia, what would be the charge on the following boiler: One vertical tubular boiler with a diameter of grate of 40 inches. 8. (*=10%*). A boiler room is to be divided by a brick wall, 18 inches thick, 12 feet high and 20 feet long. If 22 bricks are required for a cubic foot of wall of this character, how many bricks will be needed to build the wall? 9. (*=10%*). Explain some system for proper filing and recording statements of inspection. 10. (*=10%*). What system would you adopt to follow up and ascertain if the boilers are inspected at their regular time?

*Report Writing—Weight 1.* Write a report of about 150 words to the Civil Service Commission, Philadelphia, on the subject, "The Importance of Accuracy and Neatness in Office Clerical Work." Sign this report "*John Doe.*" Ideas, form and grammar will be considered in grading this report.

*Penmanship—Weight 1.* This subject will be graded on all the written work of the examination.

*Spelling—Weight 1.* 1. Cylindrical. 2. Circulation. 3. Combustible. 4. Draught. 5. Pressure. 6. Saturation. 7. Temperature. 8. Calculation. 9. Corrode. 10. Clinker. 11. Evaporation. 12. Precipitation. 13. Safety valve. 14. Column. 15. Injector. 16. Foaming. 17. Turbine. 18. Expansion. 19. Apparatus. 20. Incrustation.

**PROPERTY CLERK AND PAYMASTER, DEPARTMENT OF WHARVES,  
DOCKS AND FERRIES, \$2,000 a year, October 23.**

*Training and Experience—Weight 2.* See examination for Stenographer and Clerk, held March 8.

*Practical Questions—Weight 2.* 1. (*Credit=5%*). Locate the following points about the Harbor of Philadelphia, and state the route you would use to reach each place by land from City Hall: (a) Mingo Creek Pumping Station; (b) Point House Wharf; (c) Mouth of Pennypack Creek; (d) Pier No. 78 South Wharves; (e) Pier "A"; (f) Girard Point. 2. ( $=25\%$ ). A Department has the following officers and employees with attached salaries: Director, \$10,000 per annum; Assistant Director, \$4,000 per annum; Chief Clerk, \$2,000 per annum; one stenographer, \$900 per annum; engineer, \$3,000 per annum; two assistant engineers, at \$2,000 each per annum; two inspectors, at \$1,000 each per annum; eight inspectors, at \$900 each per annum. The Act of Assembly creating a Pension Fund states that there shall be deducted from the monthly salary of salaried employees two per cent (2%) of the monthly amount received, but in no case shall an amount in excess of \$4.00 per month be deducted. With the information given above, prepare a pay roll for the month of October, 1916, giving each official and employee mentioned above a fictitious name, and show the amount of monthly salaries, the amount deducted and paid into the Pension Fund, and the net amount received by each official and employee. 3. ( $=15\%$ ). (a) The above Department also has as employees one foreman, at \$5.00 per day; two wharfbuilders, at \$3.50 per day each; three carpenters, at \$3.50 per day each; six laborers, at \$2.50 per day each, and five laborers, at \$2.25 per day each. The Pension Fund Act mentioned in Question No. 2 gives per diem employees the privilege of accepting or declining the benefits of the Pension Fund, as they may desire. In this case, assume that the foreman and three carpenters elect to accept the benefits of this Act. Prepare a pay roll for the month of October, 1916, giving each employee a fictitious name, and assume that the foreman, two wharfbuilders, three carpenters and six \$2.50 per day laborers work the entire month, with the exception of Sunday; and that the five \$2.25 per day laborers work twenty days each. Show the amount each employee earns; the amount due from each, who have accepted its provisions, to the Pension Fund, and the net amount each employee receives. (b) The amount of the pay

roll referred to in Question No. 3-a is to be paid by the Paymaster in cash. In what denominations and in what quantities would you draw the money, the understanding being, of course, to draw as few denominations as possible. 4. ( $=10\%$ ). If you were Property Clerk and Paymaster in a Department of Wharves, Docks and Ferries, and a deckhand on a City dredge complained to you that his pay envelope did not contain the amount he considered due him, what would you do? 5. ( $=10\%$ ). A City Department has on hand July 1, 1916, one tug boat, valued at \$35,000; one tug boat, valued at \$30,000; one hydraulic dredge, valued at \$95,000; a dipper dredge, valued at \$65,000; six oak chairs, valued at \$6.00 each; one oak roll-top desk, valued at \$45.00; one oak table, valued at \$35.00; two rugs, valued at \$25.00 each; one bookcase, valued at \$30.00; one electric fan, valued at \$15.00; one typewriter, valued at \$90.00; one typewriter desk, valued at \$25.00; fourteen pontoons, valued at \$750 each, and one transit, valued at \$285.00. The condition of all the articles mentioned is good. Prepare an inventory containing the articles above mentioned, and show the value of equipment on hand in said Department July 1, 1916. 6. ( $=10\%$ ). Define: (a) Materials; (b) Supplies; (c) Equipment. 7. ( $=10\%$ ). Assume that you are Property Clerk in a Department of Wharves, Docks and Ferries, and an employee of said Department, having charge of property, notified you that certain articles under his charge had been lost or stolen, what action would you take? 8. ( $=10\%$ ). What are general classifications of the City Controller for property? Classify the following: (a) Arch Street Wharf; (b) Dredge PHILADELPHIA; (c) Lumber; (d) Sheet Iron; (e) Machine Oil; (f) Coal.

*Arithmetic—Weight 1.* 1. (*Credit=25%*). In 1895 a certain official's salary was \$1,800. In 1896 his salary was raised  $11 \frac{1}{9}\%$ , and in 1897 it was raised 10%. What did his salary average for the three years? 2. ( $=25\%$ ). Two men commenced business with equal capital. At the end of the year one had gained \$3,725.40, the other had lost \$2,376.80, and together they had \$7,897.30. How much had each at first? 4. ( $=25\%$ ). A purchased 325 head of horses and sold them so that  $\frac{2}{3}$  of what he received for them equaled the cost. If his gain was \$9,875, what did they cost him per head? 5. ( $=25\%$ ). A man distributed \$240, \$336 and \$480 among the employees of three mills in equal sums, the sums being as large as possible. Required the amount of the equal sums and the number of employees.

*Letter Writing—Weight 1.* Write a letter to the Director of the Department of Wharves, Docks and Ferries, making application for the position of Property Clerk and Paymaster in said Department, and stating your qualifications and experience. This letter is to contain about 100 words, and is to be signed "*John Doe.*" Applicants will be marked for penmanship and on their ability to clearly express facts in letter form.

*Personal Fitness—Weight 2.*

*Field and Office Systems—Weight 2.* 1. (*Credit=25%*). Outline a system of office records that would enable you to keep in permanent form all information in regard to the number of men employed, their names and addresses, the title under which each is employed, the jobs on which he has been employed, the time on each and the wages he receives. 2. ( $=25\%$ ). Outline a system for keeping record of materials, supplies and equipment for a dredging plant. 3. ( $=25\%$ ). Outline and explain a system for keeping record of materials, supplies and equipment of an entire City Department. 4. ( $=10\%$ ). In commencing a system for keeping record of property of a Department which has been organized for a number of years, how would you find what equipment has been received to date through the regular purchasing channels? 5. ( $=15\%$ ). State three ways that a City Department acquires equipment.

ENGINEERING CLERK, DEPARTMENT OF WHARVES, DOCKS AND FERRIES, \$1,000 a year, October 24.

*Training and Experience—Weight 4.* See examination for Stenographer and Clerk, held March 8.

*Practical Questions—Weight 6.* NOTE:—Neatness and legibility will have a value of ten in this examination. 1. (*Credit=10%*). It is desired to build three foundations of concrete, each four yards square and three and one-third yards high, and it is estimated that the proportions of one part cement, two parts sand and four parts broken stone will produce a mixture sufficiently strong. You are to purchase the necessary ingredients. Assume a barrel of cement contains  $3 \frac{6}{10}$  cubic feet and costs \$2.00, sand \$1.00 per cubic yard, and that stone weighs 2,700 pounds per cubic yard and costs \$1.00 per short ton. Make out an order slip showing the cost of all of them. 2. ( $=10\%$ ). A plate girder is 50 feet long and built up of 4-chord angles 6" x  $6 \frac{1}{2}$ " x 1/2", continuous web-plate 60" x 1/2", with top and

bottom cover plates, each 30 feet long  $\times 14'' \times 1\frac{1}{2}''$ ; two end angles at each end are  $5'' \times 3\frac{1}{2}'' \times 1\frac{1}{2}''$ , and eight stiffeners on each side are  $5'' \times 3\frac{1}{2}'' \times 1\frac{1}{2}''$ , fillets  $1\frac{1}{2}'' \times 3\frac{1}{2}''$  being used under all end angles and stiffeners; a cubic foot of steel weighs 489 6/10 pounds. Estimate the tonnage in this plate girder. 3. (=10%). A corrugated iron roof 96 feet wide between eaves, with pitch  $3\frac{1}{2}''$  to one foot, is 80 feet long. When laid with 3" end laps and side laps of two corrugations, using sheets 8 feet long, one square of roofing will require 125 square feet of corrugated sheets. How many square feet of corrugated iron will you order, neglecting ridge cap and eaves strip? 4. (=4%). (a) What are the distinguishing characteristics of long leaf yellow pine and short leaf yellow pine, and in what kinds of work are they used? (b) In commercial practice, in what units are lumber, cast steel, brick, crushed gravel and cement purchased? What are the meanings of the following terms: Girder, floor, beam, purlin, double hung sash, reinforced concrete, crib bulkhead, concrete bulkhead? When used in connection with pile work, define clamps, cars, sheet piles, bearing piles, spur piles, Ogee washers, tenon, halved splice. 5. (=15%). A small pier is built of piles, low water timber work, mass concrete, reinforced concrete, structural steel, corrugated iron siding, steel sash, wood sheathing, slag roof, cargo doors, cast iron rainwater conductors. Assume any quantity and price for each item that you may desire, and prepare an estimate of the cost of this work complete. NOTE:—The object of this question is to ascertain the form and manner of preparing an estimate sheet. 6. (=3%). The hypotenuse of a triangle whose angles are 30.60 and 90 degrees is 40 feet. Determine its area. NOTE:—No tables will be allowed for this question. 7. (=10%). Describe some system of filing purchases and cost data of construction work. 8. (=10%). It is desired to install a radiator, composed of 2" iron pipe and which must have a radiating surface of not less than 150 square feet, for a hot water heating system. Figure in a rough way, neglecting the thickness of the pipe and, so that error may be on the side of safety, omitting all decimals, how many linear feet of pipe will be required to construct this radiator. How many gallons of water will be required to fill it? 9. (=8%). How much would the following list of timber cost at \$40 per thousand feet B. M.: 1 stick  $8'' \times 10'' \times 15'$  long; 1 stick  $6'' \times 14'' \times 20'$  long; 1 stick  $8'' \times 16'' \times 10'-6''$  long; 1 stick  $16'' \times 18'' \times 6'-2''$  long? If freight is \$1.12 per long ton and the

timber weighs 48 pounds per cubic foot, what will the freight on the above lumber cost? 10. ( $=5\%$ ). Define a Contract Bond and a Penal Bond; state for what purpose they are applied in construction work.

CLERK AND ACCOUNTANT, DEPARTMENT OF CITY TRANSIT,  
\$1,400 a year, October 25.

*Training and Experience—Weight 2.* See examination for Stenographer and Clerk, held March 8.

*Practical Questions—Weight 4.* 1. (*Credit=10%*). Describe in detail a practical system for the distribution of supplies and for the distribution, transfer and recording of equipment, such as might be adapted to the requirements of a large organization consisting of numerous subdivisions or units, the various sections of which are located at widely separated points. 2. ( $=10\%$ ). Outline an order system for the purchase of supplies and equipment under the same conditions as specified in the first question. 3. ( $=10\%$ ). State briefly your recommendations concerning a pay-roll system calculated to meet the requirements of an organization such as mentioned in question one. 4. ( $=10\%$ ). Draw up a pay-roll form to meet the following requirements: Payments to employees made semi-monthly, by separate warrant or check; pay-roll to contain name, title and salary or rate for each employee, together with record of time worked; provision to be made for monthly deduction of percentage of salary or wages payable to employees' pension fund. 5. ( $=5\%$ ). State the best method for the indexing of a general bill or voucher file. What character of information would be supplied by such a file? 6. ( $=5\%$ ). Outline a card system which would provide a continuous record for employees entering or leaving the service, increases in salary, changes in position, etc., and state whether, in your opinion, such a record might be valuable for the checking of pay rolls. 7. ( $=5\%$ ). In connection with the publication of construction notices it is desirable to maintain a mailing list, in compact form, containing the names of different concerns which may be interested in the various classes of construction work. Give your ideas as to the simplest means of meeting the above conditions, illustrating your work with sketches of forms to be used. 8. ( $=5\%$ ). What legal documents are required to accompany each estimate presented for payment upon construction work? Describe form and character of information contained in each. 9.

(=20%). On January 1, 1916, there was authorized an appropriation of \$1,000,000 to be used toward the construction of certain municipal structures, including the payment of all salaries or other expenses in connection therewith. Dating from January 1st, a corps of engineers and assistants was employed, at the following ratings: Chief Engineer, \$3,000 per year; Head Draftsman, \$2,400 per year; two Assistant Engineers, \$1,500 each per year; five Draftsmen, \$1,200 each per year; ten Draftsmen, \$1,000 each per year. All other expenses in connection with the work are found to average \$250 per month. On January 15th, Contract "A" was executed providing for a limit of expenditure of \$250,000. On February 1st, Contract "B" was executed, with limit of expenditure of \$300,000. Prepare a statement as of July 1st, showing the unexpended and unencumbered balances of appropriation, contract expenditures to that date having amounted to \$163,468.24 for Contract "A" and to \$201,725.82 for Contract "B"; also figure the amount of money available for additional construction contracts to be completed by December 31, 1916, assuming that a full engineering organization would be required until the end of the construction period. Show all details pertaining to the preparation of the above statements. 10. (=20%). On March 1, 1916, a certain contract was executed for the construction of steel superstructure and appurtenant work for elevated railway in "X" Street from "A" Street to "B" Street, expenditures under this contract being limited to \$350,000. A lump sum price of \$310,000 was submitted for the whole work as shown on the plans, but separate unit prices were included for the adjustment of whatever additions or reductions might be required in the quantities covered by the lump sum bid. Field Return for Current Estimate No. 3, under date of June 15, 1916, embodies the following:

Item 1	Whole work, as shown on plans	65.58%	complete
" 2	Riveted steel girders	1766.5	pounds @ \$ .0315
" 6	Iron castings	158.25	" " .025
" 7	Excavation	22.46	cu. yds. " 1.25
" 8	Concrete masonry	17.95	" " 12.50
" 14	Granite Block repaving	112.56	sq. yds. " 2.50
" 15	Granolithic sidewalk paving	17.64	" " 1.75
" 16	Flagstone sidewalk paving	28.74	" " .85
" 17	Brick sidewalk paving	177.38	" " 1.10
" 21	Granolithic curb	44.85	lin. ft. " .62

Item 23 Yellow Pine lumber 5,643.6 ft. B. M. @ 56.00 per M  
 " 24 Force account \$877.65 plus 12.5%

Elapsed working time to date of estimate.....157 days

Prepare Current Estimate No. 3, complete in form and detail, to show the amount of the payment due the contractor, retaining 10% of the value of the uncompleted portion of the work and deducting a fixed charge of \$40.00 per day for all time consumed in the work. Previous payments upon contract have amounted to \$156,281.17. In addition, show the unexpended and unencumbered balances available at this date, after payment of amount due on Current Estimate No. 3.

*Report Writing—Weight 2.* Write a report in the form of a letter to the Chief Clerk outlining a practical method of keeping a continuous inventory of supplies. Ideas, form, grammar and penmanship will be considered in grading this report. Sign this report "John Doe."

*Arithmetic—Weight 2.* 1. (*Credit=25%*). Add: 67,564; 9,875.02; 115,792.4; 32.75; 9,459.25; 89,986.55; 497,325.35; 15,972.02; 7,642.56; 19,974.68; 4,321.56; 9.72. 2. (*=25%*). Divide the result of the first problem by 6,859.6, carrying the answer to the fourth decimal place. 3. (*=25%*). A rug is 8 feet 6 inches wide and contains 102 square feet. If the long sides of the rug are both four feet from the wall and the area of open floor around the rug is 228 sq. ft., what are the two dimensions of the room? 4. (*=25%*). In a school there are 1,246 boys who are 15 years of age, 879 who are 16 years of age and 742 who are 17 years of age. If the total number in the school is 3,240, what per cent of the total is represented by the 15-year-old group, the 16-year-old group and the 17-year-old group?

ASSISTANT FILE CLERK, DEPARTMENT OF SUPPLIES, \$900 a year, October 25.

*Training and Experience—Weight 2.* See examination for Stenographer and Clerk, held March 8.

*Practical Questions—Weight 3.* 1. (*Credit=15%*). Give a brief description of the various filing systems in use. 2. (*=15%*). What would you consider a good system for the filing of uncompleted and completed orders where several copies are to be issued to the Bureaus to which supplies are furnished? 3. (*=15%*). What advantages, if any, has a vertical filing system over other systems? 4. (*=15%*). In what respect does a filing

system facilitate the transaction of business in a Department having considerable correspondence? 5. (=10%). (a) What is a "perpetual inventory" of stock? (b) Describe briefly a simple method of keeping a perpetual inventory. 6. (=15%). Enumerate several mechanical devices which save time and labor in an office. 7. (=15%). Assume certain defects in a filing system. Write a letter of about 200 words to the Director of the Department of Supplies, suggesting changes that would improve the system. Sign this letter "John Doe."

*Penmanship—Weight 1.* This subject will be graded on the written work of the examination.

*Arithmetic—Weight 1.* 1. (*Credit=20%*). The Department of Supplies has received the following number of requisitions from the Departments: Public Safety, 456; Public Works, 298; City Transit, 325; Health and Charities, 397; Wharves, Docks and Ferries, 134. What is the total number of requisitions received? 2. (=20%). What percentage of the total has been received from the Department of City Transit? 3. (=20%). An order has been placed by the Department of Supplies for goods totaling \$4,592.50. If goods to the amount of \$3,393.25 have been delivered to the Department, what is the amount still to be received? 4. (=20%). The following items have been billed to the Department of Supplies: 12 gross lead pencils @ \$1.50 per gross; 3 doz. erasers @ \$0.45 per doz.; 8 gross pens @ \$0.93 per gross; 7 reams of 9" x 14" paper @ \$1.12 per ream. Extend each item on the bill. 5. (=20%). A shipment of 108 waste paper baskets was received, costing a total of \$39.96. What was the cost per basket?

*Exact Copy—Weight 2.* EXERCISE I. Make an exact copy of the following abstract:

Statistics compiled during the year, show that the business of this division increased fully 10 per cent. over that of 1913. Some idea of the volume of business handled may be formed by careful consideration of the following data:

During the year, 1,413 different concerns did business with the department, which necessitated the keeping of 4015 separate accounts, covering purchases amounting to \$2,826,803.69. In addition to this, 253 appropriation and 1587 contract accounts were kept, an increase of 146 over the previous year. Of the 1587 contracts executed, 309 were for amounts of \$1000 and over, and involved the sum of \$2,157,719.66; the remaining 1278 contracts

were in amounts under \$1000, and totaled \$372,518.13, or an average of \$291.48 each. These small contracts entailed the same amount of detail work and attention as those for the larger amounts.

**EXERCISE II.** Rearrange the following table of cities, with the amounts opposite each, in an alphabetical list:

Atlanta, Ga. ....	\$284,647	\$228,104
Louisville, Ky. ....	246,030	139,900
Washington, D. C. ....	594,925	419,544
Birmingham, Ala. ....	121,904	75,710
Memphis, Tenn. ....	191,485	133,275
Tampa, Fla. ....	100,335	54,361
Chattanooga, Tenn. ....	52,532	28,258
Ft. Worth, Tex. ....	124,243	104,840
Richmond, Va. ....	275,251	130,638
Norfolk, Va. ....	138,926	64,255
Houston, Tex. ....	179,461	76,912
<b>Totals</b> ....	<b>\$2,309,739</b>	<b>\$1,667,372</b>

*Spelling—Weight 1.* 1. Allowance. 2. Measurement. 3. Charitable. 4. Punctual. 5. Accumulate. 6. Calendar. 7. Competition. 8. Schedule. 9. Acknowledgement. 10. Genuine. 11. Flexibility. 12. Accuracy. 13. Omission. 14. Intelligible. 15. Recommend. 16. Essential. 17. Reciprocate. 18. Sustenance. 19. Destitute. 20. Significant.

ASSISTANT CLERK, BUREAU OF FIRE, DEPARTMENT OF PUBLIC SAFETY, \$1,000 a year, October 26.

*Training and Experience—Weight 2.* See examination for Stenographer and Clerk, held March 8.

*Arithmetic—Weight 3.* 1. (*Credit=20%*). Copy the following list and add up the separate columns:

Captain	1	2	1	1	3	1	2	1
Steam Engineer	4	11	5	9	5	7	2	4
Fireman	41	46	21	14	28.	37	49	11
Drivers	36	9	17	27	39	41	28	8
Laddermen	101	97	313	48	90	72	98	51
Hoseman	112	76	41	92	67	106	97	46
Machinists	5	11	47	6	12	48	7	13

2. ( $=20\%$ ). (a) Add the following fractions:  $1/2$ ,  $3/4$ ,  $5/8$ ,  $7/12$ ,  $6/24$ ,  $1 \frac{5}{6}$  and  $2/3$ . (b) Subtract  $5 \frac{4}{5}$  from  $6 \frac{5}{6}$ . 3. ( $=20\%$ ). The total number of men in the Bureau of Fire is 646. On August 1, the total number of absentees from sickness, injury and other causes was 155. What percent of the men in the Bureau were on duty? 4. ( $=20\%$ ). If the expenses of a Department are estimated to be 25 cents every second, what is the cost of conducting the Department for 365 days? 5. ( $=20\%$ ). An engine house occupies a rectangular plot of ground 40 feet wide and 120 feet long. Around the four sides is to be built a walk 3 feet wide. If 5 bricks are required to lay a square foot of walk, how many bricks will be needed to construct the whole walk?

*Penmanship—Weight 1.* This subject will be graded on all written work of the examination.

*Exact Copy—Weight 3.* EXERCISE I. Make an exact copy of the following selection:

Total number of service fires twenty (20), as follows:

January 22, 1911. 519 Arch Street; time run, one hour fifteen minutes.

January 25. 8 S. Third Street; time run, seventeen minutes.

February 2. 220 Dock Street; time run, forty-five minutes.

February 4. 125 S. Eleventh Street; time run, three hours eighteen minutes.

February 28. 605 Arch Street; time run, sixty-one minutes.

March 20. Southeast corner Ninth and Chestnut Streets; time run, fifty-two minutes.

March 23. 253 N. Broad Street; time run, two hours and five minutes.

April 3. 1206 Chestnut Street; time run, twenty-seven minutes.

April 8. 736 Arch Street; time run, twenty-three minutes.

April 13. 115 N. Sixth Street; time run, thirty-seven minutes.

April 23. Northeast corner Thirteenth and Arch Streets; time run, one hour fourteen minutes.

May 4. 240 N. Front Street; time run, fifty-seven minutes.

EXERCISE II. Make an exact copy of the following table, rearranging the months and their corresponding data in order.

## BOX AND LOCAL ALARMS

Month	1907			1908		
	Box	Local	To-tals	Box	Local	To-tals
July	71	243	314	56	368	324
September	50	165	215	47	174	221
May	77	191	268	45	201	346
December	59	259	318	77	293	370
January	74	296	370	86	280	366
October	74	189	268	71	250	327
February	83	233	366	85	273	358
August	69	191	250	54	167	221
March	86	274	360	54	256	310
June	64	191	255	60	256	316
November	53	220	273	76	265	341
April	73	266	339	71	288	359
Totals	833	2758	3391	782	2977	3759

*Spelling—Weight 1.* 1. Negligent. 2. Arrival. 3. Assign. 4. Atmosphere. 5. Physician. 6. Ammonia. 7. Hydrant. 8. Discipline. 9. Suffocate. 10. Circulate. 11. Inflammable. 12. Interference. 13. Pressure. 14. Fatigue. 15. Responsible. 16. Repetition. 17. Merchandise. 18. Continuous. 19. Generate. 20. Bulletin.

ASSISTANT CHIEF CLERK (DIVISION OF HOUSING AND SANITATION), BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$1,300 a year, October 30.

*Training and Experience—Weight 3.* See examination for Stenographer and Clerk, held March 8.

*Practical Questions—Weight 4.* 1. (*Credit=7%*). John Smith has been awarded a contract for \$3,000 for cleaning wells, and a short time afterward received an order to repair defective paving in a yard, at a cost of \$6.00, causing surface water to drain into the next house. How should these items be charged on the ledger? 2. (*=7%*). How should bills be posted for goods received in order to report to the Chief Clerk the cost of your Division for the year according to functions of Operation and Equipment? 3. (*=6%*). State how requisitions for supplies are made out and on what Department. 4. (*=7%*). Under what circumstances would a bill for the abatement of nuisances be charged on the books of the office as uncollectible? 5. (*=7%*). What is the procedure of the Department when the owner or agent of a prop-

erty fails or neglects to abate a nuisance consisting of a full privy well? 6. (=7%). State how the Board of Health obtains the names and addresses of the owners of a property on which a nuisance exists so that legal notice to abate the nuisance can be served. 7. (=6%). To what Department of the City does Councils appropriate money for use of the Board of Health? 8. (=7%). When bills are received from the Department of Supplies for goods delivered, what disposition should be made of them? 9. (=7%). What mode of procedure should be adopted in ascertaining the cost of abating a nuisance caused by defective drainage of a house? 10. (=7%). Under what authority is the Division of Housing and Sanitation empowered to abate nuisances? 11. (=7%). State the method which should be used to keep an accurate account of supplies received and disbursed. 12. (=6%). Name several mechanical devices which save time and labor in an office. 13. (=7%). (a) Define the term "Expense," as used in bookkeeping. (b) What items are properly chargeable to Expense? 14. (=6%). Make out a bill for the following goods, supplying dates, names and places of business for both debtor and creditor: 241 pairs of shoes at \$5.50 a pair; 620 yards of muslin at  $6\frac{1}{2}$  cents a yard; 24 boxes of hosiery at 75 cents a box; 7 dozen hats at \$22.50 a dozen; and 45 pairs of gloves at 75 cents a pair. 15. (=6%). Explain vertical system of filing letters.

*Arithmetic—Weight 1.* 1. (*Credit=25%*). A four-foot alley in the rear of a row of houses measures 280 feet, and the price of repaving with cement is \$2.18 a sq. yd. What is the cost of repaving the alley? 2. (*=25%*). A well containing 117 cu. ft. of filth has been cleaned by the Board of Health at a cost of 17 cents per cu. ft. What is the cost of same? 3. (*=25%*). The same well is filled with earth at a price of \$1.47 per cu. yd. What is the cost? 4. (*=25%*). A man receives \$1,300 per year, and only works 13 days in October. What amount of pay should he receive?

*Letter Writing—Weight 1.* Write a letter, in proper form, to the Civil Service Commission, Philadelphia, on the subject: "The Importance of Properly Kept Accounts in a Municipal Office." This letter should contain not less than 200 words. Sign this letter "John Doe."

*Penmanship—Weight 1.* This subject will be graded on the writing in the letter.

BOOKKEEPER, DEPARTMENT OF SUPPLIES, \$1,000 a year, October 31.

*Training and Experience—Weight 3.* See examination for Registrar, held June 15.

*Practical Questions—Weight 5.* 1. (*Credit=15%*). On September 1 the several items in the Water Bureau appropriation are credited with the following amounts:

Item 1. For fuel .....	\$96,431.18
Item 2. For hardware, tools, lumber, cement .....	8,634.56
Item 3. For furniture .....	6,480.25
Item 4. For stationery and printing.....	1,864.90

During the month the following requisitions were received from the Water Bureau, and orders issued in the amounts stated:

Sept.

1. For 185 bbls. of cement, at \$2.10 a bbl., four bags to a bbl., on which there is a rebate of ten cents on each bag returned.
3. For three desks, at \$24.30 each, and three chairs, at \$6.20 each.
5. For 864 tons of coal, at \$3.35 a ton.
8. For three sets of filing cases, at \$76.48 each.
12. For 1,143 tons of coal, at \$3.35 a ton.
17. For 8,000 letter heads, at \$2.75 per M., 8,000 envelopes, at \$1.65 per M., three dozen bottles of ink, at \$4.15 a doz.
21. For 623 tons of coal, at \$3.35 a ton.
26. For six doz. shovels, \$10.60 a doz., 8,025 feet of lumber, at \$65.00 per M. feet, and 42 wheelbarrows, at \$2.35 each.
28. For printing and binding 3,000 copies of the annual report, at \$68.70 per M.
29. For  $68\frac{1}{2}$  yards of carpet for the Chief's office, at \$1.72 $\frac{1}{2}$  a yd., three rugs, at \$18.40, \$10.75 and \$6.50 respectively.

Charge the above orders to the appropriate items, and give the unexpended balance to the credit of each item. 2. (*=10%*). Jones, Wilson & Co. sold to the Department of Supplies for the Bureau of Charities the following bill of goods: 6 bbls. of sugar, 350 lbs. each, \$6.71 per 100 lbs.; 4 cases of tomatoes, two doz. cans to a case, at \$2.49 a doz.; 1,000 lbs. of beans at .0167 per lb.; 167 lbs. of coffee at .1327 per lb.; 1 chest of tea, 47 lbs., at .1725 per lb. Prepare an invoice in proper form covering the above items. 3. (*=10%*). A bill is rendered for supplies, less a discount of five per cent, and amounts to \$764.80. What is the

amount of the bill before the discount was deducted? 4. ( $=5\%$ ). Give the cost of 186,740 lbs. of oats delivered to the various Police Stations during September, at  $63\frac{7}{8}$  cents a bushel, 32 lbs. to a bushel. 5. ( $=10\%$ ). The list price of six gross of bottles is \$90.00 a gross, ten gross of vials \$26.50 a gross, three gross of tubes \$10.50 a gross. What is the net cost of the above, subject to a trade discount of 87, 10, 5 and  $2\frac{1}{2}$  per cent? 6. ( $=10\%$ ). The Bureau of City Property has purchased through the Department of Supplies the following quantities of lumber: 54 pieces of hemlock 3 x 4 in., 16 ft. long, at \$42.50 per M. ft., B. M.; 184 pieces of oak timber 10 x 12 in., 28 ft. long, at \$114.35 per M. ft., B. M.; 87 pieces of 1 x  $1\frac{3}{4}$  moulding, 87 ft. long, at \$36.25 per M. ft., L. M. What is the amount due on the above after deducting 5% for payment in 30 days? 7. ( $=10\%$ ). A typewriter company allows the Bureau of Police \$25.00 on an old typewriter in a transaction providing for the purchase of a new machine listed at \$105.00, with two discounts of ten per cent. each. What is the net cost of the new typewriter? 8. ( $=10\%$ ). The unexpended balance in Item 2, Department of Supplies, October 1, was \$2,497. During the month orders were issued amounting to \$923.15. An order for typewriter ribbon, billed at \$15, was cancelled. On another order, the invoice, when presented, was \$38.57 more than the estimate placed on the order. Three of the orders, amounting to \$297.33, bore a discount of 5%. What was the unexpended balance at the end of the month? 9. ( $=10\%$ ). What are the fundamental elements of a legal contract? 10. ( $=10\%$ ). Compare the good features in a card index ledger system with those of a loose leaf ledger system.

*Penmanship—Weight 1.* This subject will be graded on all written work of the examination.

*Spelling—Weight 1.* 1. Accessible. 2. Receivable. 3. Deposit. 4. Persevere. 5. Verify. 6. Promissory. 7. Liability. 8. Impediment. 9. Financial. 10. Litigation. 11. Appraise. 12. Legitimate. 13. Indictment. 14. Indispensable. 15. Crystallize. 16. Revenue. 17. Transfer. 18. Miscellaneous. 19. Solicit. 20. Competent.

BOOKKEEPER (Promotion), DEPARTMENT OF SUPPLIES, \$1,000 and \$1,100 a year, October 31.

See examination for Bookkeeper, held October 31.

CLERK (Satisfaction), DEPARTMENT OF LAW, \$1,200 a year, November 2.

*Training and Experience—Weight 3.* See examination for Stenographer and Clerk, held March 8.

*Practical Questions—Weight 5.* 1. (*Credit=10%*). What are the general duties of the position of satisfaction clerk in the Tax Lien work of the Law Department? 2. (*=10%*). What is meant by a partial satisfaction, and how many copies of the description are needed? 3. (*=10%*). When no writ of *Sci. Fa.* has been issued and the whole tax bill has been paid in the tax office, how is the order to satisfy marked as to costs? 4. (*=10%*). What is meant when the order to satisfy is marked "Sheriff for costs," and when is this order used? 5. (*=10%*). If a *Sci. Fa.* has been issued in the tax lien and the Prothonotary's costs have been paid, what does the order say as to costs? 6. (*=10%*). What are the duties of the satisfaction clerk in connection with the Prothonotary's office? 7. (*=10%*). In case of erroneous assessment stricken off by the Board of Revision of Taxes, how is the order to satisfy marked as to costs? 8. (*=10%*). What is done with the orders received from the tax office after being written up? 9. (*=10%*). What are the duties of the satisfaction clerk in connection with the delinquent tax office? 10. (*=10%*). What duties not relating to satisfaction work is the satisfaction clerk called upon to perform?

*Penmanship—Weight 1.* This subject will be graded on all written work of the examination.

*Spelling—Weight 1.* 1. Statutory. 2. Session. 3. Quarantine. 4. Lieutenant. 5. Simultaneous. 6. Solicitor. 7. Supplementary. 8. Competitive. 9. Affidavit. 10. Technical. 11. Bankruptcy. 12. Assessor. 13. Surrogate. 14. Acquittal. 15. Chancellor. 16. Auxiliary. 17. Counterfeit. 18. Larceny. 19. Comparative. 20. Corruptible.

CLERK (Bond and Contract), DEPARTMENT OF LAW, \$1,400 a year, November 3.

*Training and Experience—Weight 3.* See examination for Stenographer and Clerk, held March 8.

*Practical Questions—Weight 5.* 1. (*Credit=6%*). What are the necessary steps preliminary to the award of contracts? 2. (*=7%*). What steps are necessary preparatory and preliminary to the drawing and execution of contracts? 3. (*=7%*). What

dockets are used in the Bond and Contract Department? What are the methods of keeping of the same? 4. (=7%). By what authority are proposal bonds required prior to bidding upon City work, or for City supplies? 5. (=7%). What are the steps necessary for the execution of the proposal bonds as to the security, etc.? 6. (=7%). What amount of security, if any, is required for the various contracts and by what authority is the amount fixed? 7. (=6%). What contracts require a penal bond? 8. (=6%). What is the purpose of the penal bond? 9. (=6%). What character of security is required for the contract and penal bonds? 10. (=7%). Are there any contracts where a bond is not required? If so, by what authority is this permitted? 11. (=7%). Give the necessary steps required from the inception of the contract to its conclusion. 12. (=7%). Give the titles of the various City Departments and Bureaus. 13. (=7%). Which of the City officials are authorized to execute a contract on behalf of the City? 14. (=7%). What officials of the City are required to endorse contracts and what does the endorsement indicate? 15. (=6%). What City official makes the final endorsement on a contract and what is its purport?

*Penmanship—Weight 1.* This subject will be graded on all written work of the examination.

*Spelling—Weight 1.* 1. Executor. 2. Noticeable. 3. Judiciary. 4. Amateur. 5. Dissolve. 6. Embarrass. 7. Divisible. 8. Ninth. 9. Vaccinate. 10. Surveillance. 11. Reparable. 12. Precedent. 13. Ingratiate. 14. Eliminate. 15. Alignment. 16. Affiliate. 17. Beneficence. 18. Commissary. 19. Arraignment. 20. Abeyance.

**STENOGRAPHER AND CLERK, ANY BUREAU, ANY DEPARTMENT,** \$1,200-\$1,500 a year, November 6.

*Training and Experience—Weight 2.* See examination for Stenographer and Clerk, held March 8.

*Arithmetic—Weight 1.* 1. (*Credit=20%*). (a) Add the following sums: 17,895, 4,721, 11,575, 9,810, 997,621, 239, 4,764, 98,722, 6,439, 129,989, 74,598, 149,879. (b) Divide the result of (a) by 3,427, carrying the answer to the second decimal place. 2. (=20%). (a) Subtract 47,987.92 from 57,892.451. (b) Multiply the result of 2 (a) by 987.5. 3. (=20%). (a) Add the following: 4 2/5, 6 1/6, 3 1/10, 11 1/3, 2 2/15. (b) From the result of 3 (a) subtract 7 2/15. 4. (=20%). (a) What is

the interest on \$240 at  $5 \frac{1}{2}\%$  for 3 months? (b) A, B and C are partners in an enterprise. A invests \$5,000, B invests \$20,000 and C invests \$25,000. If they agree to share profits according to the percentage of their investments, and they make \$4,977.50 the first year, what sum will each receive? 5. ( $=20\%$ ). A room is 18 feet long, 12 feet wide and 10 feet high. It has two doors, each 3 by 7 feet, and five windows, each 3 by 5 feet. If a painter is asked to paint the walls and ceiling, how many square feet will he be required to cover?

*Copying Exercise—Weight 1.* Copy the following list in tabular form, rearranging the cities in alphabetical order with their corresponding data in tabular form:

Chicago, Ill. ....	\$10,861,600	\$6,513,150
Grand Rapids, Mich. ....	335,325	171,425
Davenport, Iowa ....	33,143	57,075
Cleveland, Ohio ....	2,434,715	2,153,645
Kansas City, Mo. ....	724,115	341,220
Akron, Ohio ....	535,105	171,585
Columbus, Ohio ....	347,350	377,385
Milwaukee, Wis. ....	1,132,925	591,583
Canton, Ohio ....	138,250	43,675
Evansville, Ind. ....	277,383	57,086
Indianapolis, Ind. ....	438,823	265,190
Cincinnati, Ohio ....	790,965	336,210
Kansas City, Kan. ....	86,802	50,435
Duluth, Minn. ....	204,371	189,510

*Letter Writing—Weight 1.* Write a letter of about 250 words on "Things a Clerk Can Do to Promote Efficiency in an Office." Address the letter to the Civil Service Commission, and sign it "John Doe."

*Penmanship—Weight 1.* This subject will be graded on all written work of the examination.

*Stenography—Weight 3.*

Dear Sir:

Your letter of October 31st, requesting information regarding our Foreign Trade Bureau, reached me this morning. A review of the past year's work in the Bureau shows a steady and healthy, if not remarkable growth. There was quite a marked increase in the revenues from membership subscriptions and announcements in the publications of the Bureau, and, while the necessary added

expenses were such as to consume practically all of the resulting income, as was naturally to be expected, it has been possible, with the returns, to very materially add to the resources of the Department and to strengthen some of the weak places.

One very gratifying feature of the year's record is found in the greater frequency in the use of the Bureau by local business houses who have, apparently, begun to appreciate more fully than heretofore the advantage of having a reliable source of information on all matters pertaining to foreign trade located where it is available for immediate use, as there may be need for such information. This is evidenced by the growing number of personal and telephone calls.

Trusting that this brief review of the Bureau's activities will meet your requirements, I am,

Very truly yours,

*Stenography—Weight 3.*

The pleasure of a competitive game lies in conquering an opponent, and this follows logically from the fact that competitive games are an evolution from the primitive chase or battle. Work conducted as a competition becomes a game, and thus stimulates those engaged not only to strive with great energy, but to derive keen pleasure from the contest. The business man who continues to pile up millions, long after his wealth is sufficient to satisfy every possible want does so from pure joy in the contest to excel others engaged in the same business. He is following the law of competitive work.

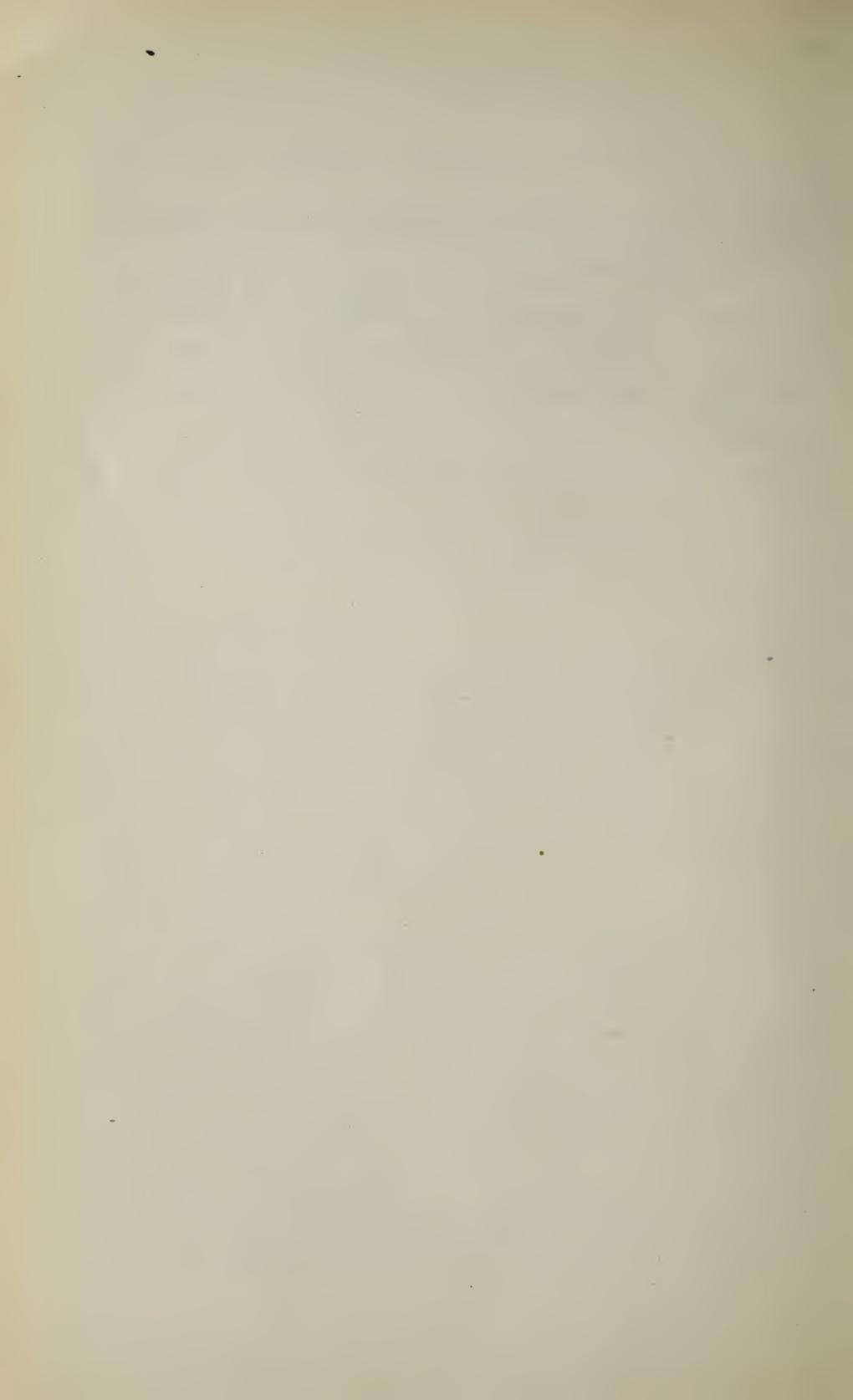
By pitting one gang of workmen against another gang the spirit of contest is easily aroused. But it is impossible to maintain this spirit indefinitely without following the seventh law of management of men—namely, by making the reward proportionate to the performance. When, however, this seventh law of management is observed, an added spirit is given to men by pitting one gang against another. Thus, in laying concrete by hand for a pavement, the best method is to have two distinct gangs working side by side, each gang concreting from the center of the street to the curb. When this is done under a bonus system of payment, the output is astonishing.

Where competing workmen cannot see one another's output, a bulletin board should be used, whereon the number of units of work performed by each man or each gang of men should be

posted. Convert work into a competitive game by organizing competing gangs of men and by posting their performance.

*Spelling—Weight 1.*

1. Perceptible.
2. Veracious.
3. Monopoly.
4. Assimilate.
5. Aggregate.
6. Anonymous.
7. Forceable.
8. Parallel.
9. Legible.
10. Effectual.
11. Promissory.
12. Privilege.
13. Imminent.
14. Contributor.
15. Manifest.
16. Visible.
17. Discrepancy.
18. Equitable.
19. Sustenance.
20. Committee.







## **ENGINEERING SERVICE (OPERATING)**

---

CHIEF ENGINEER (Lardner's Point), BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$2,400 a year, March 2.

*Training and Experience—Weight 3.* 1. What is your age? ....years....months. 2. What school did you last attend (Common, Grammar or High)? Where did you attend this school? When did you enter? When did you leave? Did you complete the course? 3. Did you attend College or a University? (Yes or no.) If you answer yes, what College or University did you attend? What course did you take? When did you enter? ....month....year. When did you leave?....month....year. Did you graduate? (Yes or no.) 4. Have you ever worked as a Stationary Engineer? (Yes or no.) Have you ever worked as a Marine Engineer? (Yes or no.) Did you ever hold a Stationary Engineer's license? (Yes or no.) What grade license was it? Where was it issued? When was it issued? How long did you hold it?....years....months. Did you ever hold a Marine Engineer's license? (Yes or no.) Give details asked concerning Stationary Engineer's license. 5. For the various plants you have operated, give names and addresses of employers, character of work done, horsepower of plant, salaries received and dates of entering and leaving each position. 6. Have you any other trade or occupation? (Yes or no.) If you answer yes, give trade or occupation, names of employers, character of work done, salaries received, and dates of entering and leaving each position. 7. Give below detailed information concerning any other work you have done, not mentioned above, which would tend to fit you for this position.

*Practical Questions—Weight 4.* 1. (*Credit=5%*). Make a sketch of the Edgemoor boiler, showing the baffles, tubes and drums. 2. (*=5%*). Either describe or make a sketch of an automatic stoker. To what do they owe their efficiency. 3. (*=5%*). How would you test your gases to ascertain that you were getting the best results from the combustion? 4. (*=5%*). On what does the efficiency of a boiler depend? What is the effect of capacity on efficiency of a boiler? 5. (*=5%*). What is considered the proper amount of burning under different draft condition of anthracite coal per sq. ft. of grate surface, also burning

of bituminous coal per sq. ft. of grate surface. What is the proportion of grate surface to heating surface for anthracite coal? Grate surface to heating surface for bituminous coal? 6. (=5%). With a boiler efficiency of 75%, the evaporation is 10.8# of water per pound of coal, and the coal consumption 3# per boiler horsepower hour. If the boiler efficiency is reduced to 50% with the same feed water temperature and condition of steam, what will be the evaporation per pound of coal and the amount of coal per boiler horsepower hour? 7. (=5%). Explain your Economizer—what advantage is it—how is it operated and kept in good condition? 8. (=5%). Explain in full a non-return valve. 9. (=5%). Explain the open feed-water heater; also the closed feed-water heater. 10. (=5%). How would you set the Corliss valves on an engine? 11. (=5%). Explain the jet condenser and make a rough sketch of the air pump. 12. (=5%). Make a sketch of the Indicator Card taken off of a low pressure cylinder of a triple expansion engine and thoroughly explain the same. 13. (=5%). If the engine is running non-condensing with a mean effective pressure of 45 lbs. per sq. in. on the piston, what will be the M.E.P. when it exhausts into a condenser of 26.5 in. of vacuum? 14. (=5%). How would you scrape in the main bearing boxes when the crank shaft was in place and know when you had made a proper running fit? 15. (=5%). If a reciprocating pump showed a high slippage where would you look for the defect and how would you correct it? 16. (=5%). A boiler 72" diameter, .4" thick, efficiency of seam .84 tensile strength 57,000, factor of safety of 5. What is the safe working pressure? 17. (=5%). (a) Make a sketch of and explain a single acting vertical pump, showing both suction and discharge valves and the plunger. (b) Explain thoroughly how electricity is generated on a D. C. machine and how it is distributed. 18. (=5%). Which is the most economically operated boiler—one with a furnace temperature of  $1,900^{\circ}$  and a stack temperature of  $450^{\circ}$ , or one with a furnace temperature of  $2,600^{\circ}$  and a stack temperature of  $500^{\circ}$ , and explain thoroughly why one is more economical than the other. 19. (=5%). The indicated horsepower of an engine is 460, diameter of cylinder 54 inches, stroke 36 inches, revolutions per minute 65. What is the mean effective pressure, neglecting the piston rod. 20. (=5%). How long will it take a triplex pump, single acting, plungers 3 feet in diameter, 5 feet stroke, 20 revolutions per

minute, 3% slip, to fill a reservoir 2,000 feet long, 500 feet wide, 40 feet deep?

*Oral Examination—Weight 3.* 1. What system would you adopt for the proper organization of the force under you? 2. What arrangements would you make so as to put the responsibility for the successful operation of the plant on each and every shift? 3. How would you arrange to keep the boilers in good condition so as to secure the highest efficiency therefrom? 4. How often would you have your tubes blown and boilers cleaned? 5. What method of firing would you adopt on mechanical stokers, and how would you ascertain which shift was securing the best results?

STATIONARY ENGINEER, ANY BUREAU, ANY DEPARTMENT,  
\$900-\$1,200 a year, March 11.

*Training and Experience—Weight 3.* NOTE:—All statements made by applicants relating to their experience are subject to investigation and verification, and the misstatement of a material fact will be deemed cause for the removal of a candidate's name from the eligible list. 1. What is your age?....years....months. 2. Did you attend Common School? (Yes or no.) How far did you go in Common School? Did you attend Grammar School? (Yes or no.) How far did you go in Grammar School? Did you attend a Manual or Trade School? (Yes or no.) Where did you attend Manual or Trade School? When did you enter Manual or Trade School? When did you leave Manual or Trade School? If you attended Trade School, what trade did you study? 3. Did you attend night school? (Yes or no.) Where did you attend night school? What course did you take? How long did you take it?....years....months. 4. Are you a Stationary Engineer? (Yes or no.) If you answer yes, fill in the following: How long have you been a Stationary Engineer?....years....months. Did you ever hold a license to operate? (Yes or no.) Where was the license issued? How long did you hold it?....years....months. 5. Have you ever worked as a Marine Engineer? (Yes or no.) If you answer yes, give details asked in fourth question. 6. If you have been employed as a Stationary or Marine Engineer, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 7. Have you any other trade or occupation? (Yes or no.) If you answer yes, give details asked in sixth question. 8. Give

below detailed information concerning any other work you have done, not mentioned above, which would tend to fit you for this position.

*Practical Questions—Weight 7.* 1. (*Credit=10%*). Make a sketch of a return tubular boiler and setting, showing the boiler fitting and the path of the gases. 2. (*=10%*). Explain a mechanical stoker with which you are familiar. Give the name of this stoker. 3. (*=10%*). How is a boiler prepared for inspection? How often should this be done? 4. (*=10%*). What is an injector? Explain in detail how it is started. 5. (*=10%*). A double-acting duplex feed-water pump has the following dimensions: 6" x 4" x 6". If the temperature of the feed water is 70°, what will be the greatest boiler HP which this pump can feed with a maximum of 140 strokes a minute? Allow 10% for slip of the pump. 6. (*=10%*). What is the difference between a throttle governor and an automatic cut off governor. Show a sketch of an indicator card taken from an engine with a throttle governor working at about half load, and tell what happens to the card as the load increases. 7. (*=10%*). How is the slide valve of a common D-slide valve engine set? How is the engine placed on dead center? How is this type of engine started? 8. (*=10%*). Explain how a burned out main bearing on an engine is repaired. 9. (*=10%*). How should two direct current generators be placed in parallel on the bushbars? 10. (*=10%*). A leak develops in a refrigerating plant and it is necessary to empty the ammonia system. Explain how the system is emptied and how it is refilled.

ROLLER ENGINEER, BUREAU OF HIGHWAYS, DEPARTMENT OF PUBLIC WORKS, \$100 a month, March 11.

*Training and Experience—Weight 3.* NOTE:—All statements made by applicants relating to their experience are subject to investigation and verification, and the misstatement of a material fact will be deemed cause for the removal of a candidate's name from the eligible list. 1. What is your age?....years....months. 2. Did you attend school? (Yes or no.) Where did you attend school? How far did you go in school? 3. Have you ever been employed as a Roller Engineer? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 4. Have you ever worked as a Stationary Engineer? (Yes or no.) If you answer yes, give details asked in third ques-

tion. 5. Have you ever been employed as a Portable Engineer? (Yes or no.) If you answer yes, give details asked in third question. 6. Give below detailed information concerning any other work you have done, not mentioned above, which would tend to fit you for this position.

*Practical Questions—Weight 7.* 1. (*Credit=10%*). What is meant by "scarifying a macadam road"? How is it done? 2. (=10%). In rolling asphalt, how can the Roller Engineer tell when it is rolled enough? 3. (=10%). What is the difference between rolling the sub-grade and rolling the surface of an asphalt street? 4. (=10%). What weight of roller is used on a brick street? How is a brick street rolled? 5. (=10%). What is the principal difficulty in starting to roll hot asphalt? How is it overcome? 6. (=10%). How is the soot removed from the tubes of a vertical boiler on an asphalt roller? 7. (=10%). Show by sketch, or explanation, the reversing mechanism used on a steam roller. 8. (=10%). Where is the steam chest located on an engine? What is it for? 9. (=10%). How is the power transmitted from the engine to the roller on a steam asphalt roller? 10. (=10%). How would you repair a leaky check valve on the feed-water line to the boiler?

ENGINEER (GAS), BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS, \$1,000 a year, March 11.

*Training and Experience—Weight 3.* NOTE:—All statements made by applicants relating to their experience are subject to investigation and verification, and the misstatement of a material fact will be deemed cause for the removal of a candidate's name from the eligible list. 1. What is your age?....years....months. 2. Did you attend school? (Yes or no.) Where did you attend school? Did you attend Grammar School? (Yes or no.) Did you attend High or Trade School? (Yes or no.) What High or Trade School did you attend? What was the highest grade you reached in school? 3. Have you ever taken a course in study in a night school while you were employed? (Yes or no.) What night school did you attend? What course or courses did you take? How many nights a week and how many hours a night did you attend?....nights....hours. How long did you attend? ....years....months. 4. Have you ever worked as a Gas Engineer? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received,

and dates of entering and leaving each position. 5. Have you ever worked as a Stationary Engineer? (Yes or no.) If you answer yes, give details asked in fourth question. 6. Have you ever worked as a gas engine builder or erector? (Yes or no.) If you answer yes, give details asked in fourth question. 7. Give below detailed information concerning any other work you have done, not mentioned above, which would tend to fit you for this position.

*Practical Questions—Weight 7.* 1. (*Credit=10%*). Make a sketch of the upper part of the cylinder of a Westinghouse Vertical Gas Engine showing the location of the valves and the igniter. 2. (*=10%*). How is the speed of a Westinghouse Vertical Engine adjusted? 3. (*=10%*). Explain the igniter used on a duplex hammer spark ignition system. 4. (*=10%*). What care must be taken with the valves of a gas engine? 5. (*=10%*). How is the proper mixture of gas and air obtained in a producer gas engine? 6. (*=10%*). It is desired to run a triplex plunger pump at a speed of 40 R.P.M. The pump is motor-driven and the speed of the motor is 1,200 R.P.M. With a 5" gear on the motor, what size gear would have to be placed on the pump? 7. (*=10%*). Explain fully how gas is made in a suction gas producer. 8. (*=10%*). Name the principal parts of a complete suction producer gas system, and tell what each is for. 9. (*=10%*). With a plant where day operation of the producer only is required, how is the producer kept over night so as to be able to start quickly in the morning? 10. (*=10%*). Explain the air and water-vapor mixing system used on a double-zone Westinghouse suction producer.

FIREMAN, ANY BUREAU, ANY DEPARTMENT, \$600-\$900 a year, March 21.

*Training and Experience—Weight 4.* 1. What is your age? 2. Did you attend school? (Yes or no.) What schools did you attend? How far did you go in school? 3. Have you ever been employed as a Fireman? (Yes or no.) How long have you been a Fireman? . . . years . . . months. 4. If you have ever worked as a Fireman, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position.

*Practical Questions (Oral)—Weight 6.* 1. (*Credit=25%*). What method should be used in firing a two-door boiler furnace

with rice coal to keep the furnace from chilling and causing smoke? 2. (=25%). In handling a stoker fire, how can one tell whether the feed is too fast or too slow? Explain fully. 3. (=25%). What action should be taken by a Fireman if the water has completely disappeared from sight in the gauge glass? 4. (=25%). What should a Fireman in a plant running 24 hours a day do when he comes on duty in his shift before accepting the boilers from the Fireman on the shift ahead of him?

PUMPMAN, ELECTRICAL BUREAU, DEPARTMENT OF PUBLIC SAFETY, \$3.00 a day.

ENGINEER, BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$1,000-\$1,080 a year, April 28.

*Training and Experience—Weight 5.* 1. What is your age? ....years....months. 2. Did you attend school? (Yes or no.) Where did you attend school? How far did you go in school? Did you attend Grammar School? (Yes or no.) How far did you go in Grammar School? Did you attend High or Trade School? (Yes or no.) What High or Trade School did you attend? Did you graduate from High or Trade School? (Yes or no.) When did you enter? When did you leave? 3. Did you attend night school while employed? (Yes or no.) Where did you attend night school? What course did you take? How many nights a week and how many hours a night did you attend?....nights....hours. How long did you attend?....years....months. 4. Have you ever been employed as a Pump Engineer? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 5. Have you ever been employed as a Pump Oiler? (Yes or no.) If you answer yes, give details asked in fourth question. 6. Have you ever been employed as a Pump Machinist and Repair Man? (Yes or no.) If you answer yes, give details asked in fourth question. 7. Have you ever been employed as a Stationary or Marine Engineer, operating engines of greater than 300 H. P.? (Yes or no.) If you answer yes, give details asked in fourth question. 8. Have you ever been employed as a Machinist? (Yes or no.) If you answer yes, give details asked in fourth question. 9. Give a complete list of any operating engineering you have done which is not contained in the above outline. 10. Give in detail below infor-

mation concerning work you have done not mentioned above which would fit you for this position.

*Practical Questions—Weight 5.* 1. (*Credit=10%*). Explain fully how a triple expansion pumping engine is started. 2. (=10%). What is meant by a center packed pump? 3. (=10%). What is meant by an inside packed pump? 4. (=10%). Explain how the intake and discharge valves of a pump work. 5. (=10%). Explain fully how a centrifugal pump is started in operation. 6. (=10%). A plant has a number of boilers feeding to the main steam line. How is a boiler started up and placed in on the line? 7. (=10%). Name two methods of putting feed water into a boiler. Explain how each works. 8. (=10%). What is a steam trap? Where are they placed? 9. (=10%). Explain the operation of pumps such as are used in connection with hydraulic elevators. 10. (=10%). Name two things which frequently cause the loss of vacuum in pumps.

STEAM HOISTING ENGINEER, BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$3.50 a day, October 27.

*Training and Experience—Weight 4.* NOTE:—All statements made by applicants relating to their experience are subject to investigation and verification, and the misstatement of a material fact will be deemed cause for the removal of a candidate's name from the eligible list. 1. What is your age?....years,....months. 2. Did you attend school? (Yes or no.) Where did you attend school? How far did you go in school? 3. Have you ever been employed as a Portable Engineer? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 4. Have you ever worked as a Stationary Engineer? (Yes or no.) If you answer yes, give details asked in third question. 5. Give below detailed information concerning any other work you have done, not mentioned above, which would tend to fit you for this position.

*Practical Questions—Weight 6.* 1. (=10%). Explain the construction of the boiler used on hoisting engines. 2. (=10%). Name and explain two ways of putting water into the boiler with steam pressure up. 3. (=10%). What is a check valve? Where and for what purpose is it used? 4. (=10%). Explain fully how the steam gets from the boiler into the cylinder of a slide

valve engine. 5. ( $=10\%$ ). Explain how to set the slide valve on a steam engine. 6. ( $=10\%$ ). What causes water to collect in the cylinder of an engine while running? How is it removed? 7. ( $=10\%$ ). A portable steam hoisting engine has just been moved to a new job. Explain fully what must be done to put the engine in operation. 8. ( $=10\%$ ). Explain the operation of raising a load on a double drum hoisting engine. 9. ( $=10\%$ ). What are the friction brakes? When are they used? 10. ( $=10\%$ ). How is a load which is hoisted and kept in the air for a time made fast?

**OILER, \$800 a year, October 28.**

*Training and Experience—Weight 4.* 1. What is your age? ....years....months. 2. Did you attend Common School? (Yes or no.) Did you attend Grammar School? (Yes or no.) 3. Give the following information for the last day school you attended: Name of school; location of school (city or town); date of entering; date of leaving; grade reached. 4. Have you ever attended night school? (Yes or no.) What night school did you attend? How many years did you attend? ....years....months. 5. Did you ever work as an Oiler? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 6. Give details asked in fifth question for any other positions you have held.

*Oral Test—Weight 6.* 1. What are the two common kinds of lubricants? 2. What is a sight feed lubricator? How is it filled? 3. How is a hot wrist pin detected? 4. What action should be taken when a hot bearing is detected? 5. If the governor rod broke with the engineer not near the engine, what would you do?

**ENGINEER, HIGH PRESSURE FIRE SERVICE, BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$1,300 a year, November 1.**

*Training and Experience—Weight 3.* See examination for Engineer (Gas), held March 11.

*Practical Questions—Weight 7.* 1. (*Credit=5%*). What proportions of air and illuminating gas are suitable for Westinghouse Vertical Gas Engines? Explain how you would find the best proportions for a particular engine. 2. ( $=5\%$ ). How is the speed controlled and how is the engine lubricated? At what level should the oil stand in the crank cases? 3. ( $=5\%$ ). How are the cylinders prevented from overheating? At what tempera-

ture should the water leave the jackets? What is the effect of higher or lower temperatures? 4. (=4%). What is the mixing valve? What are its duties? 5. (=4%). At what speed do the engines run on light load? On maximum load? 6. (=4%). What are ignitors? What are pilot lights? What are their duties? 7. (=4%). How many sources of ignition are available at the pumping stations and which is usually used in operation? 8. (=3%). What is the object of the regulator on the gas supply. 9. (=5%). Describe the operation of starting an engine. 10. (=5%). Describe the operation of shutting down the engine. 11. (=5%). Give four causes of misfires. 12. (=5%). Give four causes of backfires. 13. (=4%). How is the amount of leakage on the mains ascertained and how is a break in the mains detected at the station? 14. (=4%). What is the average pressure on the mains when the pumps are not operating? How is this maintained at each station? 15. (=4%). What pressure is put on the mains for fire service and what is the maximum allowable pressure? 16. (=4%). By whom is the amount of pressure to be given at the fire grounds determined? How is this pressure regulated at the stations, and what means are taken to prevent it from exceeding the allowable maximum? 17. (=4%). After station is put in operation on fire service, by whose orders is it shut down? 18. (=4%). What are the different types of gas engines? 19. (=3%). What is meant by the cycle of a gas engine. 20. (=5%). Describe the successive stages of the four cycle type. 21. (=3%). What is a British Thermal Unit, and what amount of energy does it represent in foot pounds? 22. (=3%). How many British Thermal Units in a cubic foot of illuminating gas? 23. (=3%). What is the weight of a gallon of water? 24. (=5%). If a pump is forcing 1,200 gallons of water a minute against a pressure of 200 lbs., what does this work represent in horsepower?

CHIEF ENGINEER (QUEEN LANE PUMPING STATION), BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$1,500 a year, November 2.

*Training and Experience—Weight 4.* NOTE:—These sheets must be filled out and brought to the examination room.

1. Give the names and addresses of two reputable stationary engineers who will vouch for the truth of your answers on this sheet.
2. What is your age?....years....months.
3. Did you

attend school? (Yes or no.) Where did you attend school? How far did you go in school? Did you attend Grammar School? (Yes or no.) How far did you go in Grammar School? Did you attend High School? (Yes or no.) What High School did you attend? Did you graduate? (Yes or no.) When did you enter High School? When did you leave High School? 4. Did you ever attend night school while employed? (Yes or no.) Where did you attend night school? What course did you take? How long did you take it?....years....months. 5. How long have you operated engines?....years....months. How long have you had a stationary license?....years....months. How long have you had a marine license?....years....months. What grade of marine license do you hold? 6. Have you ever operated or oiled pumps of 5,000,000 gals. capacity, or above? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, types and capacity of pumps, salaries received, and dates of entering and leaving each position. 7. Have you ever operated Triple Expansion Engines of 500 H. P. or over? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, capacity of engines, salaries received, and dates of entering and leaving each position. 8. Have you ever operated Cross Compound Engines of 500 H. P. or over? (Yes or no.) If you answer yes, give details asked in seventh question. 9. Have you ever operated Tandem Compound Engines of 500 H. P. or over? (Yes or no.) If you answer yes, give details asked in seventh question. 10. Have you ever had any experience as Machinist? (Yes or no.) Where did you serve your time? 11. Have you ever had charge of plants? (Yes or no.) If you answer yes, give names of employers, size and location of plant, type of engine and dates of entering and leaving each position.

*Practical Questions—Weight 3.* 1. (*Credit=6%*). What are the reasons that cause pumping engines to knock, and how would you prevent such knocking? 2. (*=6%*). Explain in order how a triple expansion steam pumping engine should be started. 3. (*=6%*). What are the reasons for loss of vacuum? 4. (*=6%*). How much clearance would you give a bearing on a 12-inch diameter crank and wrist pin for running fit? 5. (*=6%*). What is the proper time to key up a large pumping engine and why? 6. (*=5%*). What is meant by the thermal efficiency of a steam engine? 7. (*=5%*). What is meant by the mechanical effici-

ency of a steam engine. 8. ( $=6\%$ ). How would you find the dead center of an engine? 9. ( $=6\%$ ). How would you find the piston clearances, and what means would you take for checking up the clearance from time to time? 10. ( $=6\%$ ). How and when is a cylinder likely to be flooded from the condenser? (a) surface condenser; (b) jet condenser. 11. ( $=6\%$ ). What are the two most important conditions pertaining to the economical burning of anthracite coal? 12. ( $=6\%$ ). Has a mechanical self-feeding and dumping stoker any advantage over hand firing? Give reasons therefor. 13. ( $=6\%$ ). When the escaping gases show low CO<sub>2</sub>, what does it indicate? 14. ( $=6\%$ ). When taking charge of a boiler plant, state what you would do to remedy defects with a view to saving coal. Give at least eight possible instances where defects could be corrected. 15. ( $=6\%$ ). With up-to-date appliances, what per cent of the total carbon in the coal should remain in the ashes when burning No. 1 Buckwheat? 16. ( $=6\%$ ). Draw a sketch showing a side view of the drums, tubes and superheater of a Sterling or Badenhausen steam boiler, and give the location of the baffles. 17. ( $=6\%$ ). State how you would make an evaporative boiler test.

*Oral Test—Weight 3.*

CHIEF ENGINEER (LARDNER'S POINT), BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$2,400 a year, November 3.

*Training and Experience—Weight 4.* See examination for Chief Engineer (Lardner's Point), held March 2.

*Practical Questions—Weight 3.* 1. (*Credit=4%*). What are the distinctive advantages and disadvantages of Water Tube Boilers? Discuss these characteristics. 2. ( $=10\%$ ). Outline a system of operating a boiler room containing 7,500 Boiler H. P. subdivided into 15 units, stoker equipped with overhead coal supply. 3. ( $=8\%$ ). Discuss the principal features of stoker firing which require skilled attention in order to produce high efficiency. Explain a method used to check up the furnace condition and determine whether or not efficient combustion is being obtained. 4. ( $=8\%$ ). (a) What saving is effected by the use of feed-water heating systems? (b) In large plants, how does the economizer compare with the feed-water heater? (c) Name some of the principal disadvantages of the economizer. 5. ( $=4\%$ ). Name and explain two methods of preventing boiler scale used in common practice. Which method is considered the most effective

and why? 6. (=7%). Explain in detail how the speed of triple expansion vertical engines with Corliss type valves is generally governed. Why is this system used? 7. (=4%). How is a Corliss valve gear adjusted to prevent an excessive compression on the low pressure cylinder? 8. (=8%). What vacuum is generally obtained in condensers? What types of condensers are used on large units and how is the vacuum maintained in them? 9. (=8%). (a) What are the essential requirements of an engine used to drive 250 volt direct current generators of about 50 Kilowatt capacity? (b) How are direct current generators paralleled? (c) How does a generator which is overloaded act, and what precautions must be taken to prevent excessive overloading? 10. (=6%). (a) Show by sketch or explain the arrangement of engine and pump on a high duty triple expansion vertical pumping engine. (b) What gauges are attached to these units? (c) What is the function of each gauge? 11. (=5%). Large pumping engines are rated on what is known as "duty." (a) What is the meaning of the term duty as here used? (b) Explain fully how this duty is determined. 12. (=6%). What method or system can be used by a Chief Engineer to determine: (a) The quality of lubricating oil supplied; (b) The quantity that should be used for efficient lubrication; (c) The fact whether or not an oiler is properly lubricating an engine. 13. (=8%). Explain fully your action as Chief Engineer of a plant in the event of low water condition in a water tube boiler resulting in burning out some of the tubes. 14. (=10%). A pumping station contains the following equipment: 8 Pumping Engines Vertical Triple expansion, 20,000,000 gal., 175# steam pressure running condensing; 6 in operation 24 hrs., 2 in reserve. 10 boilers Watertube 500 B.H.P. each; 175# pressure; stoker equipped. 1 Economizer. 4 Vertical air pumps. 2 50 k. w. generators direct connected to engines; run non-condensing. 1 Ash conveyor. 1 Coal conveyor. Outline the working organization necessary to operate this station 24 hours a day without interrupted service. 15. (=4%). The steam passing the throttle per indicated horsepower hour of a 600 H.P. engine is 10.5 lbs. Assuming an overload on the engine of 20%, what boiler horsepower would be necessary to carry the load?

*Oral Test—Weight 3.*

CRANE RUNNER, BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$3.00 a day, November 3.

*Training and Experience—Weight 4.* For Questions 1, 2, 3, 4 and 6 see Questions 1, 2, 3, 4 and 5 for Steam Hoisting Engineer, Bureau of Water, Department of Public Works, October 27. 5. Have you ever been employed as a Crane Operator? (Yes or no.) If you answer yes, give details asked in third question.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). How is excessive pressure on the boiler prevented? Explain the device used. 2. (*=10%*). What are: (a) the try cocks? (b) the gauge glass? Where must they be placed on a boiler? 3. (*=10%*). How is a boiler prepared for inspection? 4. (*=10%*). Explain the arrangement of the engine of a locomotive crane. 5. (*=10%*). How is a load lifted and made fast for traveling on a locomotive crane? 6. (*=10%*). How are the valves set on a simple slide valve engine? 7. (*=10%*). Name the motions possible with a locomotive crane. Explain how to operate a locomotive crane to obtain all the motions mentioned. 8. (*=10%*). How is the motion of the drums on a hoisting engine reversed? 9. (*=10%*). What is the difference between a single and a double drum hoisting engine? 10. (*=10%*). Explain the purpose of the friction brakes on a hoisting engine.

FIREMAN, ANY BUREAU, ANY DEPARTMENT, \$600-\$900 a year, November 8.

*Training and Experience—Weight 4.* See examination for Firemen, held March 21.

*Oral Test—Weight 6.* 1. How should hard coal be fired and about what thickness of fire should be carried? 2. How should soft coal be fired and about what thickness of fire should be carried? 3. What is a slice bar? How is it used? What is a lazy bar? How is it used? 4. How is the quantity of water in a boiler indicated? If there is too much water in a boiler, what should be done? 5. What is a pressure gauge? How can you tell when the gauge is working right?

ASSISTANT ENGINEER, BUREAU OF CORRECTION, DEPARTMENT OF PUBLIC WORKS, \$900 a year, November 21.

*Training and Experience—Weight 4.* See examination for Stationary Engineer, held March 11.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). What is

the difference between a water-tube and a fire-tube boiler? Which is the quicker steamer and why? 2. (=10%). What are the two common types of safety valves? Describe one of the types you mention. 3. (=10%). What is the object of the blow off? What type of valve should be used in the blow off line? Why should this type be used? 4. (=10%). State and explain how to replace the suction valves in a boiler feed pump. 5. (=10%). Explain in detail how to determine the indicated horse power of an engine. 6. (=10%). Explain how the steam valve on a slide valve engine gets its motion. When an engine is not in operation, what method is used to tell whether it will run under or over. 7. (=10%). Tell in detail how the accurate dead center of an engine is found. 8. (=10%). Name the parts and explain the operation of a fly-ball governor. 9. (=10%). Explain how a steam drill operates. 10. (=10%). Name and explain the use of the parts of a steam hoisting engine.

FIREMAN ON BOAT, BUREAU OF POLICE, DEPARTMENT OF PUBLIC SAFETY, \$1,000 a year, November 4.

*Training and Experience—Weight 4.* 1. What is your age? .... years, .... months. 2. Did you attend school? (Yes or no.) What schools did you attend? How far did you go in school? 3. Have you ever been employed as a Marine Fireman? (Yes or no.) How long have you been a Marine Fireman? .... years, .... months. 4. If you have ever worked as a Marine Fireman, give names and addresses of employers, name of boat, number of boilers, H. P. of boilers, and dates of entering and leaving each position. 5. Have you ever been employed as a Stationary Fireman? (Yes or no.) If you answer yes, give names of employers, location of plant, number of boilers, horsepower of boilers, kind of coal used (hard or soft), and dates of entering and leaving each position. 6. Give below in detail other information which you have not mentioned above which would fit you for the position you are applying for.

*Oral Test—Weight 6.* 1. Explain how to handle a soft coal fire in a marine boiler. 2. What tools are used by a fireman in a boiler room? 3. What must be done with the fires when the signal to stop is given? 4. What must be done with a boiler when the water cannot be seen in the gauge glass? 5. How is the pressure on a boiler kept from getting too high? How is the device used for this purpose handled?

ASSISTANT ENGINEER, ELECTRICAL BUREAU, DEPARTMENT OF  
PUBLIC SAFETY, \$1,460 a year, November 9.

*Training and Experience—Weight 4.* 1. What is your age? ....years,....months. 2. Did you attend school? (Yes or no.) What school did you attend? How far did you go in school? Did you attend Grammar School? (Yes or no.) What Grammar School did you attend? How far did you go in Grammar School? Did you attend High School? (Yes or no.) What High School did you attend? Did you complete the course? (Yes or no.) When did you enter and when did you leave High School? Entered.... left.... Did you attend College? (Yes or no.) What College did you attend? What course did you take? Did you graduate? (Yes or no.) What year did you enter and what year did you leave? Entered.... left.... 3. How long have you been a Stationary Engineer?....years,....months. Have you a marine license? (Yes or no.) How long have you had the license?....years,....months. How long have you been a Marine Engineer?....years,....months. 4. Have you ever operated a stationary plant of above 1,000 H. P.? (Yes or no.) If you answer yes, give names of employers, location and horsepower of plant, salaries received and dates of entering and leaving each position. 5. Have you ever operated a marine engine above 1,000 H. P.? (Yes or no.) If you answer yes, give names of employers, location of plant or name of vessel, horsepower of engine, salaries received, and dates of entering and leaving each position. 6. Have you ever operated a stationary or marine plant of below 1,000 H. P. and above 250 H. P.? (Yes or no.) If you answer yes, give details asked in fifth question. 7. Have you ever acted in the capacity of Chief Engineer? (Yes or no.) If you answer yes, give details asked in fifth question. 8. Have you any other trade or occupation? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 9. Give below detailed information concerning any other position you have held which you have not mentioned above and which would tend to fit you for the position you are applying for.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). What would be preferable, a return tubular or water-tube boiler, for service in a power plant of about 2,000 Boiler H. P.? Give the reasons for your selection. 2. (*=10%*). Make a rough sketch

showing the piping connection of a feed pump system used in a plant of about the power mentioned in Question #1, giving necessary valves. 3. ( $=10\%$ ). Describe the difference between a 4-valve engine and a slide valve engine. 4. ( $=10\%$ ). What are the advantages of four-valve engines over a single-valve engine? 5. ( $=10\%$ ). An engine has the following dimensions; 22 inch cylinder, diameter 18 inch stroke and 250 revolutions per minute. The diameter of the piston rod is 2 1/2 inches. If the mean effective pressure on the crank end is 53 pounds, what indicated horse power is the engine developing on the crank end? 6. ( $=10\%$ ). Give method of procedure in bringing a generator on to the busbars. 7. ( $=10\%$ ). Give the essential feature of a log sheet for use in an office building. 8. ( $=10\%$ ). Give a general description of an exhaust heating system from the engine to the radiators. Make a rough sketch and indicate the location of the appliances you would use. 9. ( $=10\%$ ). On a 110 V. circuit the current at maximum load is 3,000 amps. If the generator efficiency is 90% and engine efficiency is 85%, what is the I. H. P.? 10. ( $=10\%$ ). In a house pumping system, what is the gauge pressure required if the water is forced to a tank on the roof 200' high? Show your calculations.

ENGINEER (PUMPING), BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$1,000-\$1,080 a year, November 10.

PUMPMAN, ELECTRICAL BUREAU, DEPARTMENT OF PUBLIC SAFETY, \$3.00 a day, November 10.

*Training and Experience—Weight 4.* See examination for Engineer (Pumping) and Pumpman, held April 28.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). Make a sketch of a boiler you have operated showing the boiler connections and arrangement of furnace and the passage of the gases. 2. ( $=10\%$ ). Explain how to start up an injector. 3. ( $=10\%$ ). What is meant by a duplex pump? How does it operate? 4. ( $=10\%$ ). How is the discharge pressure on a pumping engine controlled? 5. ( $=10\%$ ). Explain in detail how to start up a horizontal compound pumping engine. 6. ( $=10\%$ ). Give a brief description of a centrifugal pump. How is it started? 7. ( $=10\%$ ). Explain how to detect a broken piston ring in an engine. How is a snap ring replaced? 8. ( $=10\%$ ). Explain in detail how the plunger packing of a large horizontal pump is renewed. 9. ( $=10\%$ ). Make a sketch or explain the arrangement of the

valve, valve stem, spring and seat of a pump valve. Tell how this valve is renewed. 10. ( $=10\%$ ). A single cylinder double acting pump has a plunger diameter of 13", plunger rod diameter 3", stroke 2 feet. If the engine driving this pump makes 35 revolutions per minute, how many cubic feet of water will it pump in one hour with 3% slip?

ENGINEER, BUREAU OF CHARITIES, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$1,000 a year, November 22.

*Training and Experience—Weight 4.* See examination for Stationary Engineer, held March 11.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). Make a sketch of or explain the construction of a furnace such as is used under a return tubular boiler. 2. ( $=10\%$ ). Explain or make a sketch of the water column used on a boiler and tell what each part is for. 3. ( $=10\%$ ). How should a boiler be brought in on a steam main on which other boilers are connected and working? 4. ( $=10\%$ ). Explain how an open type feed-water heater works. On which side of the pump should it be placed? Why should it be placed on this side? 5. ( $=10\%$ ). A feed pump taking its suction from a hot well fails to lift the water. What is the cause of this and how can it be remedied? 6. ( $=10\%$ ). Name the parts of the valve mechanism of a simple slide valve engine and tell what each part is for. 7. ( $=10\%$ ). Explain how to set the valves of a simple slide valve engine. 8. ( $=10\%$ ). An engine has a driving pulley 36" in diameter and runs at 200 revolutions per minute. If it is belted to the main driving shaft, how can the speed of the driving shaft be reduced to 125 revolutions per minute? 9. ( $=10\%$ ). Where an engine bearing runs hot, what should be done? Why should this be done? 10. ( $=10\%$ ). What is the difference between engine oil and cylinder oil? What other kinds of lubricants are used on an engine and where is each used?





# ENGINEERING SERVICE (TECHNICAL)

LABORATORY ASSISTANT (PHYSICAL), BUREAU OF SURVEYS,  
DEPARTMENT OF PUBLIC WORKS, \$900-\$1,000 (Inc.) a year,  
January 4.

*Experience—Weight 25.* Any false statement made by the applicant in answering these questions will be regarded as good cause for excluding him from the eligible list or for removal or discharge during probation or thereafter.

1. What is your age? ....years,....months.
2. Did you attend Grammar School? (Yes or no.) If so, fill in the following: (a) Date of entrance; (b) date of graduation or leaving; (c) reason for leaving.
- (d) If you were not graduated, state the grade you were in when you left.
3. Did you attend a High School? (Yes or no.) If you answer yes, fill in the following: (a) Name of school; (b) course pursued; (c) date of entrance; (d) date of graduation or leaving; (e) reason for leaving; (f) if you were not graduated, state the class you were in when you left.
4. Did you attend a Technical School? (Yes or no.) If so, give details asked in third question.
5. Did you attend any evening schools? (Yes or no.) If so, fill in the following: (a) Names of schools? (b) Courses pursued at each school? (c) Date of entrance? (d) Date of graduation or leaving? (e) What was your daily occupation while attending evening school?
6. (a) What is your trade or occupation? (b) What training did you receive for it? All dates must be given. (c) How long have you followed it? ....years,....months.
7. Referring to the positions you have held, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position.
8. Give the names and addresses of your employers whom you would be willing to have consulted as references.

*Practical Questions—Weight 75.* 1. (*Credit=10%*). Describe the proper method of sampling a carload of Portland cement.

2. (*=12%*). Describe in detail the tensile strength test for Portland cement. State the minimum requirements for tensile strength.

3. (*=10%*). Give in detail the test for constancy of volume of cement.

4. (*=14%*). Describe in detail the mechanical analysis of sand. Define effective size and uniformity co-

efficient. 5. ( $=12\%$ ). Explain in detail the laboratory method of obtaining the density of concrete. State the purpose of this test. 6. ( $=8\%$ ). A piece of trap rock is weighed in air and then submerged in water and reweighed with the following results: Weight in air, 35.427 g.; weight in water, 23.083 g. Compute the specific gravity of the trap rock. 7. ( $=12\%$ ). A cylindrical measure 15" in diameter, 18" high and weighing 9 3/4 lbs. was filled with the above crushed trap rock and found to weigh 184 1/2 lbs. Compute the per cent of voids in the stone. 8. ( $=12\%$ ). The Bureau of Highways' specifications require that refined asphalt shall have "a consistency not harder than 30 penetration." What does this mean? Give a complete description of the penetration test. 9. ( $=10\%$ ). (a) Define elastic limit. (b) How is the elastic limit of steel determined?

DRAFTSMAN, DEPARTMENT OF CITY TRANSIT, \$1,000-\$1,200 a year, January 4.

*Training and Experience—Weight 3.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 7.* 1. (*Credit=4%*). Define the following: (a) Radius of gyration; (b) Bending moment; (c) Camber; (d) Impact; (e) Moment of resistance; (f) Traction load; (g) Centrifugal load; (h) Annealing. 2. ( $=4\%$ ). (a) How is the camber allowance usually made? (b) How is allowance made for impact? 3. ( $=15\%$ ). The Fink truss for a roof has a span of 60 ft. c. to c. end bearings and a rise of 20'. The purlins divide the roof into eight panels. The load of each panel point is 4,500#. Compute: (a) The center to center length of each member to the 32d of an inch. (b) The stress in each member. (c) Make up a stress sheet on a separate sheet. 4. ( $=10\%$ ). A floor is carried on 15" 42# I-beams. The span is 20'. The static load is 500# per linear foot. It is desired to put up a telferage suspended from the center of these beams. What is the maximum load that the telferage can carry? The S for the I is 58.9. Use 12,000# unit stress. 5. ( $=7\%$ ). Compute the radius of gyration of a stringer built of a plate 18" x 1/2 and 4 angles 4" x 3" x 1/2, the 4" leg outstanding. Ignore the fillets on the angles and allow for one line of 3/4 inches with a gauge of 1 3/4". 6. ( $=10\%$ ). (a) Compute the maximum B. M. in a beam, whose span is 30', produced by two moving concentrated loads of 12,500# each, spaced 5' apart. (b) Draw the

B. M. diagram for the above position of loading. 7. ( $=50\%$ ). Using the stress sheet for the Fink Truss in Question No. 3, make a complete detail design of the truss, using the following unit stresses:

Tensile	15000#/ sq. in.
	15000
Compressive	<hr/> #/ sq. in.
	$1 + \frac{1^2}{7000 r^2}$
Bearing	24000#/ sq. in.
Shearing	12000#/ sq. in.

Make a finished detailed drawing, in India ink, of one-half of the truss.

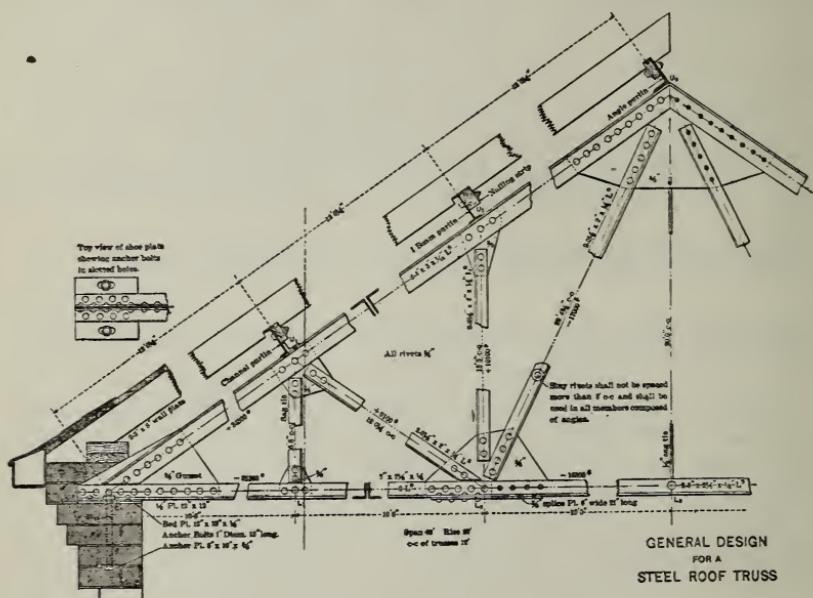
Tabulate a bill of material, and give the customary notes.

TRACER (18 years or over), DEPARTMENT OF CITY TRANSIT, \$600 a year, January 6.

*Training and Experience—Weight 2.* 1. What is your age? ....years, ....months. State what school you last attended. What class or grade did you reach? 2. What is your trade or occupation? How many years have you actually worked at it? 3. Referring to the positions you have held, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 4. Give the particulars about any special work you have done in addition to the above which tends to qualify you for the position you are now seeking.

*Practical Questions—Weight 8.* 1. (*Credit=10%*). What is the difference in the two sides of tracing cloth? What are the advantages and disadvantages of each in making a tracing? 2. ( $=10\%$ ). What treatment is given tracing cloth to make it take the ink readily? What precaution must be taken in treating this difficulty? 3. ( $=10\%$ ). How is an inked line erased? What precautions must be taken, first, in making the erasure, and secondly, in inking over the erasure? 4. ( $=10\%$ ). How is a tracing cleaned from pencil lines and soiling? 5. ( $=10\%$ ). How must color be applied to a tracing to get the best results? 6. ( $=15\%$ ). Copy the following paragraph in India ink in your best style of free-hand lettering.

The sides and ends of buildings shall be figured for a uniformly distributed wind load of 20 pounds per square foot of exposed surface when 20 feet or less to the eaves, 30 pounds per square foot of exposed surface when 60 feet to the eaves and proportionately for intermediate heights. 7. (=35%). Make a tracing of the blue print furnished you in your best workmanship.



STRUCTURAL DRAFTSMAN, DEPARTMENT OF WHARVES, DOCKS AND FERRIES, \$1,200-\$1,500 (Inc.) a year, January 7 and 10.

*Training and Experience—Weight 3.* For Questions 1 to 8, see examination for Laboratory Assistant (Physical), held January 4. 9. (a) Have you had three or more years of engineering experience? (Yes or no.) (b) Have you spent two or more years in a bridge or structural drafting room? (Yes or no.) If so, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position.

*Practical Questions—Weight 7.* NOTE:—No hand-books to be used in Questions 1 to 5, inclusive. 1. (*Credit*=4%). Give the bearing values in tons per sq. ft. of the following: (a) Hard rock;

(b) Shale rock; (c) Dry sand and dry clay; (d) Soft clay or loam. 2. ( $=8\%$ ). Design a foundation for a column carrying 100 tons from the following data: Bearing power of soil 2.5 tons per square foot; required section of top of footing 2'-0" x 2'-0". 3. ( $=10\%$ ). Draw a dimensioned cross-section of a timber bulkhead 12' high. Show keys and splices in all members. 4. ( $=8\%$ ). Compute the size Y. P. beam required to carry a uniform load of 6 tons on a span of 16'-0". 5. ( $=20\%$ ). Make a layout of the steel framework of a shed 60' x 120', designed to carry a dead load of 20 lbs. per square foot and a snow load of 25 lbs. per square foot of horizontal projection. The roof has a one-sixth pitch. Height from floor to bottom of truss 20'-0". Make up a complete stress and data sheet for one bent. NOTE:—Handbooks may be used in connection with Question 6. 6. ( $=50\%$ ). Using the stress and data sheet from Question No. 5, make a complete detailed design of one bent. Make a finished drawing in India ink, showing all dimensions, sizes, connections, bill of material and necessary notes.

CHAINMAN, DEPARTMENT OF CITY TRANSIT, \$600-\$720 a year,  
March 7.

*Training and Experience—Weight 22.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 78.* 1. (*Credit=16%*). Describe in detail the method of measuring the distance between two points, A and B, situated respectively at the bottom and summit of a hill. 2. ( $=12\%$ ). State the common sources of error in chaining. 3. ( $=8\%$ ). If a course of a survey passes through a building, explain how the course should be chained. 4. ( $=8\%$ ). Explain the method of laying off a right angle with a tape. Illustrate the method by a sketch. 5. ( $=8\%$ ). (a) What care should be taken of steel tapes? (b) How is rust removed from them? 6. ( $=12\%$ ). The area of a circle is 2,178.52 sq. ft. Compute the length, in feet and inches, of the diameter. 7. ( $=8\%$ ). One side of a rectangular field, containing 3.17 acres, is 245 ft. long. How many rods of fencing are required to inclose the field? 8. ( $=8\%$ ). The elevation of one end of a street, 466 feet long, is 95.42, and the grade from this point to the other end is—3.75%. Compute the elevation of the other end. 9. ( $=10\%$ ). (a) Make a neat sketch of a vernier of a leveling rod. (b) Explain its construction and operation. 10. ( $=10\%$ ). Before starting the

excavation for a rectangular pier, ABCD, the following level notes were taken: Rod reading on B. M., 2.97'; Rod reading on A., 4.79'; Rod reading on B., 5.72'; Rod reading on C., 7.42'; Rod reading on D., 5.32'. Elevation B. M. = 52.30. Excavation carried to elev. 30.00. Length AB = length CD = 75'; length AD = length BC = 25'. Arrange the above level notes in proper form, and compute the amount of excavation required for the pier in cubic yards.

ASSISTANT ENGINEER IN CHARGE OF TESTING LABORATORY,  
BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS, \$3,000 a  
year, March 10 and 11.

*Training and Experience—Weight 4.* NOTE:—All statements made by applicants relating to their experience are subject to investigation and verification, and the misstatement of a material fact will be deemed cause for the removal of a candidate's name from the eligible list. 1. Give the names and addresses of two reputable citizens who will vouch for the truth of your answers on this paper. 2. What is your age? . . . years, . . . months. 3. (a) Give the names and locations of the preparatory schools you have attended: Name of school; location of school; course pursued; date of entrance; date of graduation or leaving; reason for leaving. If you were not graduated, state the class you were in when you left. (b) Did you attend a Technical School? (Yes or no.) If you answer yes, give details asked in Question 3 (a). 4. (a) What practical experience have you had since leaving school? Explain fully, stating where you have been employed; the names of your employers; dates of entering and dates of leaving their employ; the reasons therefor, the salaries received and the nature of the work you performed. (b) Has your experience been continuous? How many years of office work and how many years of field work have you had? College or school work MUST NOT be included as years of experience. 5. From what positions have you been discharged? For what causes? 6. Referring to the positions you have held, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 7. State any other experience or training you have had that would tend to fit you for the position which you are now seeking. 8. Give a list of all Civil Service Examinations that you have taken, stating title and salary of each position, date of examination, and the result, whether passed or failed.

*Practical Questions—Weight 6. Physics.* 1. (*Credit=5%*). Describe in detail the various tests suggested for determining the setting time of cement, comparing them as to their relative accuracy and value. 2. ( $=5\%$ ). Write a letter containing detailed instructions to inspector assigned to take charge of mill and shop inspection of a steel bridge. 3. ( $=5\%$ ). Compare the relative advantages of tensile and compression tests for cement, and outline what tests you would make if you were writing a specification in which compressive strength was to be substituted for tensile strength in determining the value of cements. 4. ( $=5\%$ ). Outline what physical tests you would make to determine the relative protective value of certain competitive paints to be used on steel structure. 5. ( $=5\%$ ). Describe what tests you would make to determine the relative value of several makes of paving bricks submitted, and state what information each test will give as to the probable durability of the brick. 6. ( $=5\%$ ). Describe what tests you would make to determine the relative value of several makes of building stone submitted, and state what information each test will give as to the probable durability of the stone. 7. ( $=5\%$ ). Submit criticism of the present specification for Portland Cement of the American Society for Testing Materials, pointing out in what particulars the specification is defective, and where, in your opinion, changes would be advisable; also what these changes should be. 8. ( $=5\%$ ). Submit outline of tests for waterproofing compounds to be used in waterproofing concrete subway construction. 9. ( $=5\%$ ). Submit detailed specification for testing sand and crushed stone to be used in important concrete construction. 10. ( $=5\%$ ). Submit detailed specification for testing materials entering into asphalt paving work. 11. ( $=5\%$ ). What is turpentine? What special meaning has "wood turpentine"? What adulterations are to be looked for in the examination of turpentine? 12. ( $=5\%$ ). What are drying oils? How should they be analyzed? 13. ( $=5\%$ ). Describe the complete analysis of a clay. 14. ( $=5\%$ ). What effects have the following substances on a limestone, which is to be used for making lime: iron, silica, magnesia and organic matter? 15. ( $=5\%$ ). Discuss the various methods in use for the volumetric determination of iron. 16. ( $=5\%$ ). Describe the tests which you would make to evaluate a solid fuel. 17. ( $=5\%$ ). How would you tell whether the impregnating material used in wood blocks is coal-tar or water-gas tar? 18.

(=5%). A bronze contains copper, lead, tin and phosphorus. Describe the determination of each constituent. 19. (=5%). Discuss the various methods for determining carbon in steel. 20. (=5%). Discuss briefly the methods in use for protecting structural iron from corrosion.

CHIEF DRAFTSMAN (Promotion), BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$1,800 a year, April 3 and 4.

*Training and Experience—Weight 4.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). (a) What is a river intake? (b) What are the essential features which must be observed in the design of a river intake? (c) Show a neat pencil sketch of an efficient river intake. 2. (=10%). Make the design calculations of a water piston rod to be used on a single-acting vertical pump, 30-inch plunger, 5-foot stroke, working against a head of 120 feet; piston speed, 220 feet per minute. The rod is to be made of Tobin bronze with a tensile strength of 75,000 lbs. per square inch, and to be supported or steadied at its upper end by a cross head running in vertical guides. 3. (=10%). (a) Determine the capacity of a feed-water pump necessary to handle boilers with a total of 1,000 horsepower normal rating. Under peak load conditions the boilers are operated at 150 per cent rating. (b) In laying out a plant, what precaution should be taken to insure positive feed water supply? 4. (=10%). How many square feet of surface would be required in a surface condenser used on an engine consuming 9,500 lbs. of steam per hour to give the following conditions: Exhaust pipe, temperature at the condenser, 113 degrees; vacuum in condenser, 27.68 inches; condensing water temperature, 40 degrees; water leaving condenser, temperature, 70 degrees? 5. (=10%). Supposing it is intended to install a mechanical coal and ash handling system in Queen Lane Pumping Station, show an outlined sketch of the arrangement of the system, supplementing it by whatever explanation necessary to bring out the reasons for the selection of the system you give. 6. (=8%). Name three types of condensers and describe conditions under which you would recommend the installation of each type, assuming the situations which determine your choice. Use sketches to illustrate, if necessary. 7. (=8%). Make your own assumptions to the effect that a 10-million gallon turbo-

centrifugal pump is to be installed in one of the Water Bureau pumping stations. Make sketches and explanatory notes which you would hand to a draftsman to work up the preliminary studies for such an installation. 8. ( $=8\%$ ). What appliances would you recommend for a complete boiler room installation in order that all necessary data for a study of the efficient operation of the plant may be obtained? In the above, assume a certain boiler equipment. 9. ( $=8\%$ ). Assume any one of the larger pumping stations of the Bureau of Water. With \$200,000 to expend under normal market conditions, what changes would you recommend, giving reasons therefor. 10. ( $=10\%$ ). A boiler room consists of sixteen 300-horsepower water-tube boilers, 8 on a side, with the firing aisle through the center. Each side is divided into two banks of 4 boilers each, with a cross aisle running between the banks. The steam main leaves the building passing through the side wall directly above the cross aisle. Explain in detail how the system of steam pipes should be arranged in the boiler room so as to prevent shut down in case of accident to any one of the banks. 11. ( $=10\%$ ). Make a drawing of the boiler room explained in question No. 9, showing the steam main system and location of all valves.

RODMAN, DEPARTMENT OF CITY TRANSIT, \$840-\$960 a year, April 4.

*Training and Experience—Weight 24.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 76.* 1. (*Credit=5%*). Give three common sources of error in reading the target on a rod. 2. ( $=5\%$ ). Give three common sources of error in reading a high rod. 3. ( $=5\%$ ). If you were given a rod you had never used before, what examination would you make of the rod to satisfy yourself of its accuracy or of special care needed in using it? 4. ( $=10\%$ ). Give five requirements for a transit which are met by adjustments. 5. ( $=4\%$ ). What is meant by: (a) Height of instrument; (b) backsight; (c) foresight; (d) turning point? 6. ( $=6\%$ ). Why is it important to take readings with greater care on turning points than on intermediate points? 7. ( $=10\%$ ). Give the method of making the adjustment of the Bubble tube in the Wye-Level. 8. ( $=15\%$ ). In running a line of levels the following observations are made. Rule up a proper form, make the proper notes and compute the elevation of each point:

Elev. of B. M.	92.647	
Reading on B. M.	5.392	
Station 0	9.75	
0 + 50	8.16	
Station 1 + 00	7.36	
1 + 25	6.19	
1 + 50	5.18	
2 + 00	4.28	
T. P.	3.762	8.456
2 + 50	7.35	
3	6.27	
3 + 50	5.33	
4	4.63	

9. (=20%). A traverse of a field bounded by a body of water gives the following results:

Side AB	Bearing N	7° — 54' — 28' E	Length	483.46	feet
" BC	"	N 86° — 45' — 19" W	"	384.63	"
" CD	"	S 9° — 38' — 35" S	"	226.43	"
" DE	"	S 20° — 10' — 12" E	"	243.96	"

A and E are on the banks of the body of water. Calculate the bearing and length of the line E. 10. (=20%). Compute the area included by the five lines. Give the answer in acres.

PITOMETER OPERATOR, BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$3.50 a day, April 5.

*Training and Experience—Weight 3.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 7.* 1. (*Credit=15%*). (a) Define specific gravity. (b) How is the specific gravity of a liquid determined? Explain the method in detail. (c) What is the specific gravity of the liquid commonly used in pitometric work? Is this ever varied? Why? 2. (=15%). (a) Make a neat sketch of a pitometer in position in a main. (b) Upon what principle does the pitometer operate? 3. (=15%). (a) Make a neat sketch of the U tube gauge attached to the pitometer, showing all the cocks. (b) Explain the method of setting up the gauge and what occurs when the instrument is in use. 4. (=15%). (a) Make a neat sketch of the cross section of a Venturi meter. (b) Describe the method of measuring flow by means of this meter. 5. (=20%). (a) What are the objects of a water-

waste survey? (b) Describe in detail the method of conducting a water-waste survey, covering an area three blocks long and two blocks wide, referring to a lettered sketch. 6. ( $=20\%$ ). The cross section of a 30-inch pipe is divided by concentric rings into 5 equal areas. A pitometer set in the center of each section in succession gives the following deflection, starting at the top of the pipe and going down. The pitometer coefficient is 0.84. 1.01", 4.54", 10.98", 16.15", 23.48", 26.24", Center 25.32", 22.77", 16.78", 9.84", 3.53". Find the mean velocity, plot the velocity curve to scale, determine the pipe coefficient and the discharge in gallons per day.

ASSISTANT ENGINEER, BUREAU OF HIGHWAYS, DEPARTMENT OF PUBLIC WORKS, \$2,500 a year, April 7 and 8.

*Training and Experience.* NOTE:—In answering the questions on Experience, the statements made must be clear and concise, giving all dates necessary to show the length and character of experience. Any false statement made by the applicant in answering these questions will be regarded as good cause for excluding him from the eligible list or for removal or discharge during probation or thereafter.

1. What is your age?
2. (a) What Grammar School did you attend? What grade were you in when you left Grammar School? (b) Give the names and locations of the High or Preparatory Schools you have attended, the length of time spent in each, and the course pursued. Dates of graduation or leaving school must be given. If you left school before graduation, state what class you were in when you left.
- (c) What technical course have you pursued? Give the names of the schools, dates of entering and dates of leaving. If you have not been graduated, state the reasons and tell the class you were in and what subjects you covered before leaving.
3. State the construction and maintenance experience you have had in the following classes of work: (a) Railroad; (b) highway, park, and boulevard; (c) sewer or bridge; (d) surveying and regulating. Explain fully, stating where you have been employed; the names of your employers; dates of entering and dates of leaving their employ; the reasons therefor, the salaries received and the nature of the work you performed. In each case, state whether your work was in the office or in the field.
4. Have you ever supervised the work of employees? If so, give complete details.
5. What has been your experience in an executive capacity?
- 6.

(a) Of what technical societies are you a member? State grade of membership. (b) State any other experience or training you have had that would tend to fit you for the position which you are now seeking.

*Practical Questions—Weight 4.* 1. (*Credit=10%*). Suppose a water-bound macadam road has been in use for about 6 months, when it is desirable to surface treat it with bituminous material. (a) Discuss the classes of bituminous material that might be used. (b) Describe in detail a proper method for doing the work. 2. (=10%). (a) When and under what conditions is it advisable to use "split block" paving? (b) Describe fully the method of procedure for doing this work. 3. (=10%). Write specifications covering materials and method of construction of a concrete base for a street pavement. Suppose this pavement is 30' wide and 1,800' long, and that the proportion of the mix is 1:3:5. What quantities of each of the ingredients will be necessary to complete this work? Give your answer in commercial terms, assuming that a barrel of cement is equivalent to 3.6 cu. ft., and a yard of stone to 2,700 pounds. 4. (=10%). State precautions necessary to secure best results in laying the following pavements and give a cross section sketch of each, for roadway 30 feet between curb lines: Stone block, brick, wooden block, asphalt, Macadam (water-bound and bituminous). 5. (=10%). (a) Outline the field work necessary and the progressive steps in carrying out a parkway improvement contract. (b) Suggest the most suitable type of curb, gutter, roadway and footway development for a 200-ft. wide parkway. 6. (=10%). (a) Give comparative merits of various kinds of highway pavements and the conditions to which each is most applicable. (b) Write a short synopsis of essentials in laying out a system of city streets on the fringe of developed territory. 7. (=10%). (a) Draw cross section of a grate-top inlet and an open-mouth inlet, showing especially the size and position of the outlet pipe. (b) Discuss the relative merits of these inlets. 8. (=10%). Draw four complete City blocks. Assume elevations at the corner of all blocks. Main sewer is to be placed in the first street and branch sewers in the others. Sewers are to be of concrete. Show on the sketch the location of all inlets and briefly describe the reasons for your selections. Mention the factors which are necessary in designing these sewers. 9. (=10%). (a) Show freehand a typical cross section of a bridge with one trolley track in the

center, showing construction of paving if asphalt is to be used for the wearing surface. (b) Show by sketch how you would treat steam railroad tracks in a city street, cross sections of rail, street paving, etc. (c) A small road bridge is to be built across a stream span about 15 to 20 feet. Sketch your ideas as to a suitable design. 10. ( $=10\%$ ). Give in detail what should be done in successive steps from the time an ordinance is introduced into Councils for paving a street until full completion.

*Personal Fitness (Oral)—Weight 2.*

ASSISTANT ENGINEER, BUREAU OF HIGHWAYS, DEPARTMENT OF PUBLIC WORKS, \$2,100 a year, April 7 and 8.

*Training and Experience—Weight 3.*

*Practical Questions—Weight 5.*

*Personal Fitness (Oral)—Weight 2.*

Questions are the same as in examination for Assistant Engineer, \$2,500, held April 7 and 8.

DRAFTSMAN, BUREAU OF HIGHWAYS, DEPARTMENT OF PUBLIC WORKS, \$600-\$900 a year, April 17.

*Training and Experience—Weight 2.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 8.* 1. (*Credit=10%*). A lot has a frontage on A street of 58 feet with a walk 9' 6" wide. The side is on Tenth street with a depth of 97 feet and a width of walk of 7' 9". The corner has a radius of 10 feet. What will a concrete walk cost if the price is 18 cents per square foot? 2. ( $=10\%$ ). Explain with sketch the geometric method of: (a) Dividing a line into any number of equal parts; (b) laying out a parabolic curve, given the span and rise. 3. ( $=5\%$ ). Explain in detail with a sketch how, with the use of a tape only, you would locate a valve box in the street. 4. ( $=10\%$ ). The length of the block A-B is 469 feet. The elevation at A is 67.15, the grade towards B + 1.5%. The elevation at B is 69.42 and the grade towards A is + 2.47%. How far from A is the summit and what is its elevation? 5. ( $=10\%$ ). Copy the following in your best style of freehand lettering: "It is most essential that the letters in a word or a series of words should be of uniform size and accurately in line. This does not imply that each letter shall occupy exactly the same space, for that is obviously impossible if we consider the various shapes of letters, but that letters similar

in shape shall be similar in size throughout." 6. ( $=15\%$ ). Assume a city block 383.64 feet long, width 12-36-12. The intersecting streets have the same width. The street contains a water main, gas main, sewer, an electric light and a telephone conduit. You are sent out to locate them. Assume sizes and location. Prepare a set of notes for the survey. 7. ( $=40\%$ ). Make a dimentioned plan finished in India ink and water color of the street just shown. Use a scale of  $1'' = 20'$ .

DRAFTSMAN, BUREAU OF HIGHWAYS, DEPARTMENT OF PUBLIC WORKS, \$900-\$1,200 a year, April 17.

*Training and Experience—Weight 24.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 76.* 1. (*Credit=10%*). A lot has a frontage on A street of 58 feet with a walk 9' 6" wide. The side is on Tenth street with a depth of 97 feet and a width of walk of 7' 9". The corner has a radius of 10 feet. What will a concrete walk cost if the price is 18 cents per square foot? 2. ( $=10\%$ ). Explain with sketch the geometric method of: (a) Dividing a line into any number of equal parts; (b) laying out a parabolic curve, given the span and rise. 3. ( $=5\%$ ). Explain in detail, with a sketch, how, with the use of a tape only, you would locate a valve box in the street. 4. ( $=10\%$ ). The length of the block A-B is 469 feet. The elevation at A is 67.15, the grade towards B + 1.5%. The elevation at B is 69.42 and the grade towards A is + 2.47%. How far from A is the summit and what is its elevation? 5. ( $=10\%$ ). Copy the following in your best style of freehand lettering: "It is most essential that the letters in a word or a series of words should be of uniform size and accurately in line. This does not imply that each letter shall occupy exactly the same space, for that is obviously impossible if we consider the various shapes of letters, but that letters similar in shape shall be similar in size throughout." 6. ( $=10\%$ ). If the angles of a triangle be A, B and C, and the opposite sides be a, b, c, given  $B = 39^\circ 17' 28''$   $a = 43.692'$   $b = 84.673'$ , compute, using logarithms, the remaining angles, side and the area of the triangle. 7. ( $=10\%$ ). Assume a city block 383.64 feet long, width 12-36-12. The intersecting streets have the same width. The street contains a water main, gas main, sewer, an electric light and a telephone conduit. You are sent out to locate them. Assume sizes and location. Prepare

a set of notes for the survey. 8. ( $=35\%$ ). Make a dimensioned plan, finished in India ink and water color, of the street just shown. Use a scale of  $1'' = 20'$ .

DRAFTSMAN, DEPARTMENT OF CITY TRANSIT, \$1,000-\$1,200 a year, April 18 and 19.

*Training and Experience—Weight 3.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 7.* 1. (*Credit=10%*). A column base is supported over the center of an opening spanned by two Bethlehem Girder Beams 28" deep 180.0# per lin. foot. Section Modulus 518.9. The dead load carried by these beams is 1,400# per lin. foot. The center to center length of the span is 18'. What load can the column carry without overloading the beams? Use a unit stress of 16,000 pounds per square inch. 2. ( $=15\%$ ). In placing the columns for an elevated station at a street intersection, points A, B, C, D are located; E is subject to the conditions that it must be 12' from the line joining C and D and so placed that the distances CE and DE be equal. AB = 92.00; DA = 45.179'; BC = 39.770'; Angle A =  $59^\circ 40' 49''$ ; B =  $101^\circ 20' 35''$ . Required the length BE and the angles BCE and ADE. 3. ( $=25\%$ ). Given a Pratt Truss with 7 panels of 21 feet each, height at hip 23 feet, at next panel 26 feet, at the center panel 27 feet. The dead load is 3,800# per lin. foot. Find the dead load stress in each member. 4. ( $=50\%$ ). Given the following data for a plate girder, make a complete detail drawing in India ink. Give a bill of material, with an estimate of the weights. Make a title and full notes in your best style of lettering. Show computations for all data not given.

Span B. to B. of Ls 75' 0"

	Max. End Reaction	Max. End Shear
Dead Load	34,700	28,900
Live Load	146,000	120,000
Impact	119,300	102,000
<hr/> Total	300,000	250,900

Max. Mom. per Girder	
Dead Load	632,800
Live Load	2,331,500
Impact	1,906,000
	4,870,300

Unit Flange Stress 15,000 lb. per square inch;  
 Shear 10,000 # per sq. in.; Depth 96 $\frac{1}{2}$ " B. to B. of Angles;  
 Web 96" x 7/16".

Flanges

2 Ls 6" x 6" x $\frac{3}{4}$ "	= 16.88 sq. in. gr.	= 13.88 sq. in. net
1 cover plate 16" x 9/16" full length	= 9.00	= 8.00
2 plates 16" x $\frac{1}{2}$ "	= 16.00	= 14.00

Rivet  $\frac{7}{8}$ " diam.

Interior Stiffeners 2 Ls 5" x 3 $\frac{1}{2}$ " x  $\frac{3}{8}$ " 2 Fills 3 $\frac{1}{2}$ " x  $\frac{3}{4}$ ".

At splice 3 Ls 5" x 3 $\frac{1}{2}$ " x  $\frac{3}{8}$ " 2 pl. 24" x 7/16" and 4, 5" x  $\frac{3}{4}$ " Plates.

At ends over walls.

Make girders round ends radius 30" bending flange angles and cover plate. Inside 3 Ls 5"x 3 $\frac{1}{2}$ "x  $\frac{3}{8}$ ", outside 2 Ls 5"x 3 $\frac{1}{2}$ "x  $\frac{3}{8}$ "

DRAFTSMAN (BRIDGE DIVISION), BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS, \$1,200 a year, April 19 and 20.

*Training and Experience—Weight 35.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 65.* 1. (*Credit=15%*). Compute the maximum B. M. and shear in a deck plate girder bridge of 60 ft. clear span. The live load to be an interurban car, weighing 50 tons, carried on two trucks 34' 6" c. to c.; the axles are 6' 6" c. to c. Assume the usual dead load for ties, rails and guard rails. The girders are spaced 7' 6" c. to c. 2. (*=10%*). Assuming a suitable effective depth and unit stress, compute the net area of the flanges at the center of the above girder. 3. (*=15%*). A center span floor panel is to be 15 ft. square. The slab is to be fully continuous and reinforced in both directions. Design the slab and beam for a live load of 400 lbs. per square foot. Consider the depth of the beam as fixed at 20" from the top of the slab to the under surface of the beam. 4. (*=5%*). What are the economic ratios of depth to span for each of the following: (a) Plate girders; (b) pony truss; (c) through truss.

5. ( $=5\%$ ). Name three methods of allowing for expansion, and state when each would be employed. 6. ( $=20\%$ ). Obtain the live and dead load stresses in all the members of a Pratt truss from the following data: Span 7 panels at  $20' 0'' = 140' 0''$ ; depth of truss  $25' 0''$ ; dead load, 2,100 lbs. per lin. ft.; live load, 3,000 lbs. per lin. ft., together with a moving concentrated load of 20,000 lbs. at any point on the floor. 7. ( $=30\%$ ). Write a short thesis of the methods to be pursued in a reconnaissance for a bridge across a deep ravine in a park with rocky side slopes, the conditions which would influence you in determining the type of structure, the materials of construction, and provisions for illumination. Indicate the steps you would take from the beginning to the completion of the structure. Sketch in India ink a view and cross section of the bridge.

TRACER, DEPARTMENT OF CITY TRANSIT, \$600 a year, April 26.

*Training and Experience—Weight 2.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 8.* 1. (*Credit=5%*). What is the difference in the two sides of tracing cloth? 2. ( $=5\%$ ). State when each side should be used. 3. ( $=7\%$ ). How do you treat the cloth to make it take the ink readily? What precautions must be taken in this treatment? 4. ( $=8\%$ ). How can pencil marks and soiling be taken off a tracing without injuring the ink lines? 5. ( $=8\%$ ). How must the ink lines be erased? What precautions must be taken before the erasure is inked over? 6. ( $=7\%$ ). What precautions must be taken in printing on tracing cloth with a hand press? 7. ( $=20\%$ ). Write in your best style of freehand lettering the following:

Spacing is the most difficult part of lettering which the inexperienced draughtsman will have to overcome. The precise shape of the various letters is of less moment than the preservation of the main characteristics of the type and the judicious arrangement of the respective letters into words. It is impossible to lay down any universal rule for the distance apart of the letters, so much depends upon circumstances.

Generally the lettering of architectural and technical drawings is rather closely spaced, whilst that of maps, estate plans and the like are widely spaced, as in the latter it is desirable that the words should indicate the extent of the land, etc., they are placed upon or refer to. Uniform rather than equal spacing should be

aimed at, and this is best obtained by so arranging the letters that the white space or words between them shall be approximately equal in area. To obtain this uniformity the letters must be spaced according to their shape.

8. (=40%). Tracing—A 60-foot through Plate Girder.

CHAINMAN, ANY BUREAU, ANY DEPARTMENT, \$600 and less a year, May 2.

*Training and Experience—Weight 2.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 8.* 1. (*Credit=10%*). (a) What is the length of the Gunter's chain? (b) Describe the construction of an engineer's chain. 2. (=10%). State the advantages and disadvantages of a chain compared with a steel tape. 3. (=15%). Describe in detail the method of measuring a line, about a quarter of a mile long over rough, sloping ground. 4. (=10%). Name the principal sources of errors in chaining. 5. (=10%). Describe the method of passing an obstacle, in the course of a survey, with a tape. 6. (=10%). (a) Explain how to do up a tape in a figure eight. (b) How is a steel tape cleaned and kept in good condition? 7. (=10%). The length of a sewer trench is 689.42', its width 12', and its mean depth 28' 7". Compute the amount of excavation in cubic yards. 8. (=15%). The hypotenuse of a right triangle is 4 rods 2 yds. 1 ft. 5 in., the altitude 10 yds. Compute the length of the base in feet and decimals to four places. 9. (=10%). The distance between two points was measured with a "100 ft." steel tape and found to be 1,684.628'. When the tape was compared with the standard, its actual length was determined as 100.045'. Compute the true distance between the above points.

PRINCIPAL ASSISTANT ENGINEER, BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS, \$4,500 a year, May 2 and 3.

*Training and Experience—Weight 55.* For questions 1 to 8 see examination for Laboratory Assistant (Physical), held January 4. 9. Give, in a general way, the amount and kind of practical experience you have had in design. 10. Give the extent of your experience in the actual work of management. 11. Give any other experience you have had that would tend to fit you for this position.

*Technical Questions—Weight 45.* 1. (*Credit=10%*). (a)

Show, by diagram, a proper organization to carry on the work in the different divisions of the Bureau of Surveys. (b) Enumerate by divisions the office records that are essential in the conduct of a bureau comprising the activities shown by the diagram above.

2. (=10%). (a) Give a synopsis of not more than 1,200 words of the most important functions of the Bureau of Surveys and the procedure that is proper in their performance. (b) Describe briefly a system of management which will secure the most efficient service from the employees and produce the best results as to output, promptness and records, both in design and construction.

3. (=10%). (a) Describe the process in the design and construction of a sewer or sewer system, step by step. (b) Sketch the cross section of a main sewer 10 ft. diameter, choosing two types of foundation materials.

4. (=10%). (a) A sewer has a small amount of covering; its span is 10 ft. Design a proper top, choosing your loading. Sketch cross section. (b) A roadway crosses a stream 75 feet above it. What type of bridge would you build? Give reasons. Make sketch of view and cross section.

5. (=10%). (a) A section of the city has three streets crossing at various angles a two-track railroad at grade. Sketch plan and proper profiles of streets and railroad to abolish the grade crossings. (b) A street block, 500 feet in length, has ascending grades of three and four per cent from each end toward a summit. Assume street elevations and determine the position and elevation of the summit.

6. (=10%). Write a short specification for Portland cement concrete to be used in sewer or bridge construction. Ditto for steel reinforcement. Ditto for timber platform. Ditto for precast reinforced concrete pipe.

7. (=10%). Describe the process of registering a real estate transfer. Legal requirements to prepare and perfect a city plan. Procedure to secure a drainage connection.

8. (=10%). (a) Indicate the steps to prepare a contract estimate. Give the steps in making a contract. (b) Give briefly the salient points to be considered in a sewage collection and sewage disposal system and results to be achieved.

9. (=10%). Write a report of about 500 words to your superior officer upon an engineering investigation, with recommendation.

10. (=10%). Sketch a "junction chamber" with cross sections, and comment on variations due to different foundation materials.

TRANSITMAN, DEPARTMENT OF CITY TRANSIT, \$1,200-\$1,500 a year, May 3.

*Training and Experience—Weight 3.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 7.* 1. (*Credit=15%*). (a) Name, in their proper order, the adjustments of an engineer's transit. (b) Describe clearly the method of making the line of sight perpendicular to the horizontal axis. 2. (*=15%*). Describe clearly three adjustments to the Wye level, giving the method of making and the purpose of each adjustment. 3. (*=10%*). The following observations were taken in running a line of levels. Tabulate the work in standard form, supplying the elevations and such information as you may consider necessary.

Elevation of B. M.		62.594
Reading on B. M.		5.193
Station 0		8.392
1		7.356
2		6.453
3		5.136
T. P.		4.632
T. P.		5.258
4		5.122
5		4.273
6		3.218
7		1.957
8		1.439
T. P.		4.953
9		4.753
10		4.323

4. (*=5%*). It is determined to run a street with line of the elevations of problem 3 as its center line. The elevation of the finished sub-grade at Station 0 is 60.584. The rate of grade is +.575%. Compute the cut or fill at each station. 5. (*=12%*). Given the following data in a closed plot A-B-C-D-E: AB N 60—15 E, 428.56; BC S 70—10 E, 308.76; CD S 35—30 W 293.45; DE N 65—05 W, 167.13. Compute the bearing and length of EA and the area of the figure. 6. (*=15%*). The deflection angle at the point of intersection of two tangents is  $34^\circ 13'$ . It is desired to join these tangents by a curve with a radius of 850'. Compute the length of the curve, the tangent distance and the

deflection from the tangent for each one-hundred foot station. Give a full set of notes for staking out the curve and explain the method used. 7. ( $=8\%$ ). How many men are required for an efficient corps on city surveys, and what are the duties of each man? 8. ( $=10\%$ ). Show two methods of referencing important points that will be displaced in the course of work and must be replaced. 9. ( $=10\%$ ). Part of the notes of a topographical survey is as follows:

	5.24	3.43	C. L.	1.63	0.49
15 + 00	—	—	2.675	—	—
	35	10		15	42
	6.57	5.15		3.25	1.16
+ 65	—	—	3.493	—	—
	30	12		12	38
	8.19	6.12		4.16	2.19
16 + 00	—	—	4.963	—	—
	32	11		12	36
	10.23	8.16		4.10	2.13
+ 50	—	—	6.483	—	—
	35	15		10	35
	12.19	7.33		3.19	1.18
17 + 00	—	—	7.125	—	—
	34	14		11	36

The height of instrument is 69.472. The elevation of the bottom of excavation is 64.956 at station 15 + 00. Grade is — 3.125%. Width at bottom of cut 22 feet, slope  $1\frac{1}{2}$  to 1. Find the excavation in these two hundred feet.

ASSISTANT ENGINEER (Abolishment of Grade Crossings), (25 years or over), BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS, \$2,500 a year, May 4 and 5.

*Training and Experience—Weight 4.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). What are the functions of the City Field Engineers on work conducted jointly by the City and the Railroads, as is usual in the abolishment of grade crossings? Describe in some detail the character

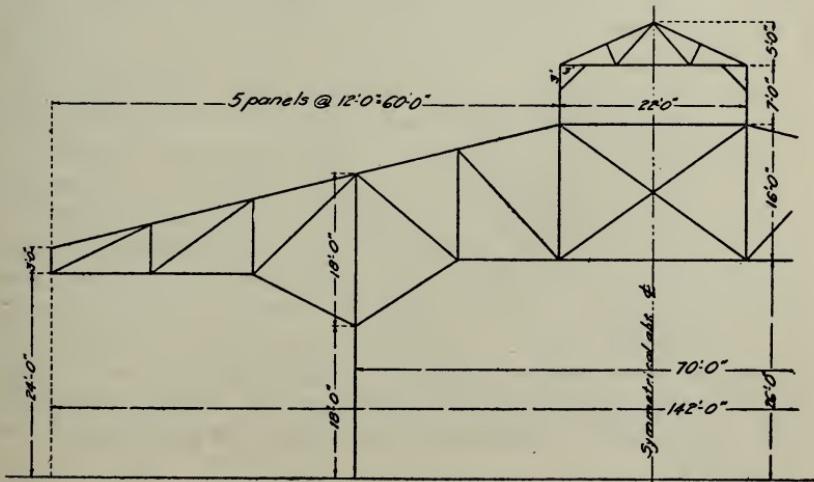
of the work performed by the field forces. 2. ( $=15\%$ ). In a populous section, where it is proposed to depress the street, so as to pass under a line of railroad, to avoid a grade crossing, what would be the procedure in making the necessary changes in the sewers, the water distribution, gas and electric system? and describe in some detail the method of underpinning the houses where they are principally three-story dwellings, and give the order in which the work should be performed. 3. ( $=8\%$ ). What should be the minimum thickness of a layer or stratum at sub-grade on which you would build a bridge abutment, a continuous gravity retaining wall, or elevated railroad on individual footings in the following materials, if underlaid by rock: heavy gravel, fine sand or clay? What is the safe allowable quiescent load per square foot on heavy gravel, fine sand or dry clay for such structures as we are considering? 4. ( $=12\%$ ). Under what conditions are piles used? and further differentiate under what condition you would use wooden piles, concrete piles, and steel concrete filled piles. Define quicksand. What is the usual method of handling it in a place where it is not possible to drain it by gravity? 5. ( $=12\%$ ). What are the usual uses in construction work of bank sand, bar sand, and beach sand; and what are the principal characteristics of each? Name the principal characteristics of the ballast materials used in the manufacture of concrete, as broken stone, gravel, slag, etc., and the relative advantages of each. What are the essentials of Portland cement? 6. ( $=5\%$ ). What length of mass concrete retaining wall can be built between expansion joints? What is the usual custom in providing for expansion in mass rubble retaining walls? What percentage of steel is necessary in reinforced concrete retaining walls to prevent expansion cracks? 7. ( $=5\%$ ). How would you prevent drainage and rainwater from running down over the bridge seat and down the front of the abutment? 8. ( $=8\%$ ). To what extent would it be necessary to increase the height of a fill between retaining walls, so that after settlement it would be to grade? Fill 25 feet; materials, sand and gravel. 9. ( $=10\%$ ). Write a report to your superior officer of not more than 1,000 words of an investigation of a structure and give your recommendations. 10. ( $=15\%$ ). NOTE:—Handbooks may be used. Design a cantilever retaining wall to restrain a level earth bank 14 ft. in height from the following data: Depth of the base of footing, 4 ft.; allowable soil pressure, 2 tons per sq. ft.; weight

of earth, 100 lbs. per cu. ft.; coefficient of friction of concrete on earth = 0.40;  $f_s = 16,000$  lbs. per sq. in.;  $f_c = 650$  lbs. per sq. in.

**STRUCTURAL DRAFTSMAN, ANY BUREAU, ANY DEPARTMENT,** \$1,200-\$1,500 (Inc.), a year, May 4 and 5.

*Training and Experience—Weight 3.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 7.* 1. (*Credit=12%*). Design a sheet pile coffer dam, inside dimensions 32' x 80', to be used in water 13' deep, with a mud bottom. Assume the allowable bending stress in the wet timber as 1,000# per sq. in. 2. (*=8%*). Compute the volume of concrete in a column footing 8' deep, whose upper face is a 3' x 4' rectangle, the batters of the sides are  $5\frac{1}{4}''$  to 1' for the 4' edge and  $4\frac{1}{2}''$  per ft. for the 3' edge. 3. (*=8%*). Enumerate the forces that should be considered in the design of a high pier which supports a single track railway bridge across a tidal river. 4. (*=8%*). State the allowable unit tensile stresses in pounds per square inch of the following: (a) L. L. yellow pine; (b) hemlock; (c) wrought iron; (d) medium steel (give range of values used in building construction). 5. (*=14%*). Obtain the stresses in all members of the pier bent shown on the accompanying blue print, using the following data: Distance center to center of trusses, 25'-0"; dead load 25 lbs.



per sq. ft. of horizontal projection; snow load 30 lbs. per sq. ft. of horizontal projection. Make up, on a separate sheet of paper, a complete stress and data sheet for one bent. 6. ( $=50\%$ ). Using the stress and data sheet from question No. 5, make a complete detailed design of one bent. Make a finished drawing in India ink, showing all dimensions, sizes, connections, bill of materials and necessary notes.

THIRD ASSISTANT TO CHIEF, BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$1,600 a year, June 15.

*Training and Experience—Weight 4.* Any false statement made by the applicant in answering these questions will be regarded as good cause for excluding him from the eligible list or for removal or discharge during probation or thereafter.

1. What is your age?
2. Did you attend Grammar School? (Yes or no.) Were you graduated from Grammar School? (Yes or no.) If so, give date of graduation. If you were not graduated, give the date of leaving and the grade you were in when you left.
3. (a) Did you attend High School? (Yes or no.) (b) If you did attend High School, how long did you remain there and on what date (month and year) did you leave High School? (c) If you were graduated from High School, give the date (month and year) of your graduation.
4. (a) Have you pursued any course of study in school (business, trade, technical) since leaving High School? If so, give names of schools, dates of entering and dates of leaving, course or courses pursued, and whether you finished the course or not. (b) If you attended night school, give dates and tell what occupation you followed while attending night school.
5. In general, what is your occupation? How long have you followed it?
6. (a) Give the names, addresses and kind of business of all your employers. (b) State the title of the position you held under each employer, salary you received, the length of time you were employed, giving dates, and the reasons for leaving each employer.
7. From what positions have you been discharged for cause, and what were the causes?
8. State exactly and in detail the kind of work you were doing in each of the leading positions you have filled in the past five years.
9. Give the particulars about any special work you have done, in addition to the above, which tends to qualify you for the position you are now seeking.

*Practical Questions—Weight 6. 1. (Credit=10%). Indi-*

cate, on the map furnished, the approximate boundaries of the distribution areas for water in Philadelphia. 2. ( $=10\%$ ). Describe the function which East Park Reservoir performs in the distribution system. 3. ( $=10\%$ ). Describe briefly the organization for maintenance and extension of the distribution system. Indicate wherein this organization could be improved. 4. ( $=10\%$ ). Describe a mapping or record scheme for a distribution system which would permit quick location of essential valves and pipes in case of an emergency. 5. ( $=10\%$ ). Assume a break in the 48-inch main leading from Lardner's Point to Wentz Farm. What steps would you take to repair this break and insure a maintenance of the water supply during repairs? 6. ( $=10\%$ ). Assume a four-alarm fire in the vicinity of Twelfth and Reed streets about noon on a Monday. What steps would you take to increase available water supply for the fire engines? 7. ( $=10\%$ ). Describe an ideal organization for a Purvey District office to have control of the distribution system in West Philadelphia. 8. ( $=10\%$ ). Outline an organization for a central Water Bureau repair and maintenance headquarters at Twenty-sixth and Master streets. 9. ( $=10\%$ ). Describe the steps to be taken by a householder desiring water pipe to be laid in a certain street. 10. ( $=10\%$ ). Make an estimate of cost per lineal foot for laying 6-, 8-, 12-, 20- and 48-inch cast iron pipe, assuming pipe at \$28 a ton, ordinary labor at 25 cents an hour, work to be done in newly opened streets in Philadelphia, no rock to be encountered and no paving or other similar items.

ASSISTANT ENGINEER OF SEWER PLANS, BUREAU OF SURVEYS,  
DEPARTMENT OF PUBLIC WORKS, \$3,000 a year, June 15.

*Training and Experience—Weight 5.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 5.* 1. (*Credit=10%*). (a) Describe in detail the procedure in designing a system of stormwater sewers for a given area within the borders of a municipality. (b) Give a detailed description of the "Philadelphia Formula" for calculating stormwater run-off. (c) Give a detailed description of the "Concentration (or Rational) Theory" for calculating stormwater run-off. 2. ( $=10\%$ ). (a) Give an accepted formula for determining the size of sewer required to discharge a calculated run-off. (b) What size circular sewer will be required to drain an area of two hundred acres, having an average slope of

3 feet per thousand feet, assuming the grade of sewer to be 0.6 feet per thousand feet? 3. (=10%). (a) What are the essential requirements in sewer design? (b) What data should be collected for investigations for the improvement of the formulæ used in determining run-off? 4. (=10%). (a) Describe the system of drainage you would use for collecting and disposing of the normal or dry-weather flow from an area of two hundred acres, where the stormwater outlet cannot be used for sewage and where the nearest sewage outlet is 5,000 feet distant and 40 feet higher than the lowest point to be drained. (b) Describe in detail the pumping equipment and capacity required for a semi-suburban character of development over the above area and give your reasons for its selection. 5. (=10%). (a) Design a reinforced concrete rectangular section sewer 8 feet by 8 feet with 6 feet of cover, the live load to be a truck wheel of 10 tons and the foundation to be clay with a safe bearing capacity of 3 tons per square foot. (b) Estimate the cost of this section for a length of 100 feet. 6. (=10%). Outline briefly a form of specification for sewer design and construction. 7. (=10%). (a) State the requirements governing the construction of branch sewers. (b) Give in detail the procedure for the construction of a main sewer from the authorization by Councils to the final payment and acceptance by the City. (c) Give in detail the requirements and procedure for the construction of a sewer at private cost and the authority for same. 8. (=10%). (a) Write a form of ordinance to authorize the construction of main sewers. (b) What bonds are required in connection with proposals and contracts for sewer work? 9. (=10%). Describe the method you would use in filing and indexing the plans and records of the drainage system of a large city. 10. (=10%). (a) Write a letter in answer to a request from an operative builder that a sewer be constructed in a certain street. (b) Write a letter in answer to a complaint of flooding at a street intersection during a storm.

FIRST ASSISTANT TO DISTRICT SURVEYOR (Promotion), BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS, \$1,200-\$1,400 (Inc.), a year, August 2.

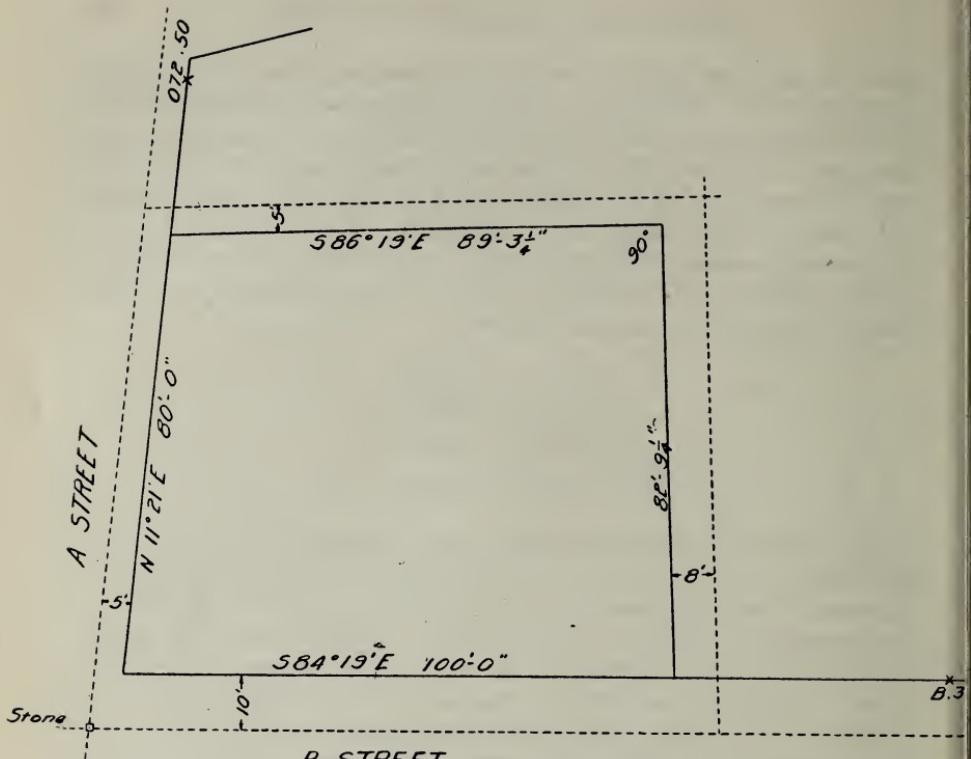
*Training and Experience—Weight 4.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). Describe a sectional City plan, giving all the information it should have

upon it, and the legal procedure required to make it an official document. 2. ( $=10\%$ ). What influences affect measurements with a steel tape? What precautions should be taken to insure accuracy? 3. ( $=10\%$ ). How much may a party wall be built over on the adjoining lot? 4. ( $=10\%$ ). State the general shape and size of sewers being built in Philadelphia and kind of material usually used. What do you consider the best methods of giving stakes? 5. ( $=10\%$ ). In a five-sided field four of the sides are known and are as follows:

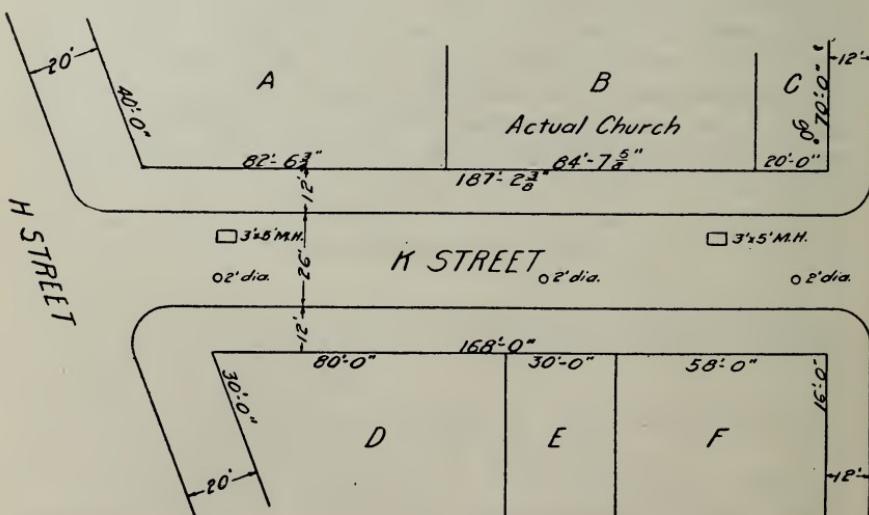
S  $7^{\circ} 20'$  E 185.60'  
S  $74^{\circ} 10'$  W 200.00'  
N  $35^{\circ} 35'$  W 160.25'  
N  $16^{\circ} 10'$  E 206.50'

Compute the length and bearing of the remaining line. Use logarithms. 6. ( $=10\%$ ). Calculate the distances required to stake out the lot running on the range lines, as shown in Fig. 1. Use natural functions. 7. ( $=10\%$ ). Describe how you would check your work in Question No. 6. The cartway of K street, shown in Fig. II, was paved from the curb line of G street to the curb line of H street; sewer, water pipe and curved curbs of 10' radius put in. H street has a sewer and water pipe in with the frontage paid. G street has no sewer or water pipe therein. 8. ( $=10\%$ ). Give amount of sewer bill for each lot. 9. ( $=10\%$ ). Give amount of water pipe bill for each lot. 10. ( $=10\%$ ). Give total square yards of paving laid. Give total square yards of paving assessable. Give total square yards of paving in intersections. Give amount of paving bill for lot E, at \$3.00 per square yard. Give the length of curved curb required at each corner.



B STREET

*Fig. I.*



*Fig. II.*

DRAFTSMAN (SEWAGE DISPOSAL DIVISION), BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS, \$1,400 a year, August 30.

*Training and Experience—Weight 3.* See examination for Laboratory Assistant (Physical), held January 4.

CIVIL SERVICE COMMISSION  
CITY OF PHILADELPHIA

DECLARATION SHEET

This sheet must be filled out, signed and sworn to by the applicant, and then folded and placed inside the envelope.

1. What is your full name?.....
2. What is your full address?.....

AFFIDAVIT.

(The following oath must be taken before a notary public, or other officer authorized to administer oaths for general purposes, and the officer's signature must be authenticated by official seal. If the oath be taken before a justice of the peace, or other officer who has no official seal, his official character must be certified by the Clerk of the court, Secretary of State, or other proper officer, under official seal).

I, the undersigned, do solemnly swear (or affirm) that the execution of the tracing required in question number nine, under the subject of Practical Questions, together with the preparation of the original drawing thereof, are entirely my own work, and I have received no assistance or suggestions whatsoever.

Signature of competitor.....

Subscribed and sworn to before me by the above-named competitor this ..... day of ..... 1916, at .....  
County of ..... and State of .....

(Signature of Officer).....

(Official Seal) (Official Title).....

(The official seal must not be omitted.)

*Practical Questions—Weight 7.* 1. (*Credit=5%*). Using sketch "A," make an estimate of the quantities of excavation, concrete and pounds of reinforcement per lineal foot of sewer. Assume reasonable unit prices and determine the estimated cost of sewer per foot. 2. (*=5%*). Using sketch "B," determine the

length of the center line shown between points "X" and "Y." 3. ( $=5\%$ ). Determine the rate of discharge of a rectangular weir 6 feet long, without end contractions, when depth of water flowing over weir is  $7\frac{1}{4}$  inches. 4. ( $=10\%$ ). Design a concrete slab having a span of 10 feet and a uniformly distributed load of 200 pounds per sq. ft. Make sketch showing thickness of slab and size and disposition of steel reinforcing rods.

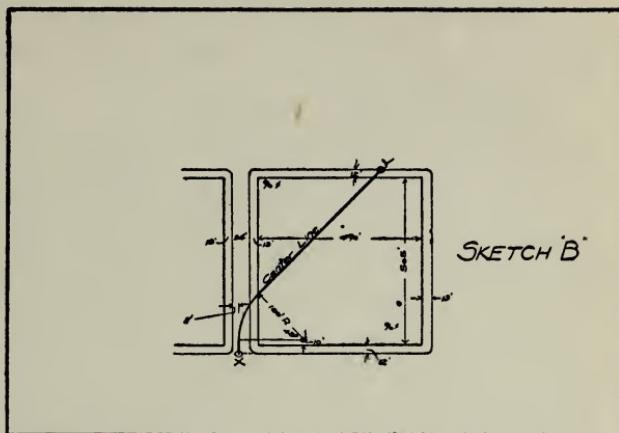
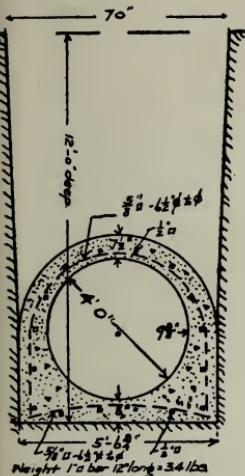
Using  $M = 104 \text{ bd}^2 p = .0077$

5. (*Credit=20%*). Using sketch "C" determine the quantity of sewage at points "D" and "E" for the purpose of designing the intercepting sewer. 6. ( $=10\%$ ). Using the data from question 5, determine size of the intercepting sewer between points "D" and "E" and velocity of flow, using  $C = 110$  and the sewer running half full. 7. ( $=15\%$ ). Make sketch showing the scheme which you recommend for the connection between the combined and intercepting sewer at point "D" on sketch C. 8. ( $=10\%$ ). Write a description, consisting of about 300 words, of the project adopted for the collection, treatment and disposal of the sewage of Philadelphia. 9. ( $=20\%$ ). Make and return within three days to the Civil Service Commission a tracing  $16'' \times 20''$ , showing a 4-foot diameter brick sewer with full concrete cradle in a 50-foot wide street. Show plan, profile and cross section of street and sewer. Assume and show all necessary distances and elevations. Place suitable title for a contract drawing in lower right-hand corner. The accompanying affidavit must be taken before a notary public, or other officer authorized to administer oaths for general purposes. The sheet must be folded and sealed in the envelope and returned with the tracing.

ARCHITECTURAL ENGINEER, DEPARTMENT OF CITY TRANSIT,  
\$2,000-\$2,200 (Inc.) a year, September 18 and 19.

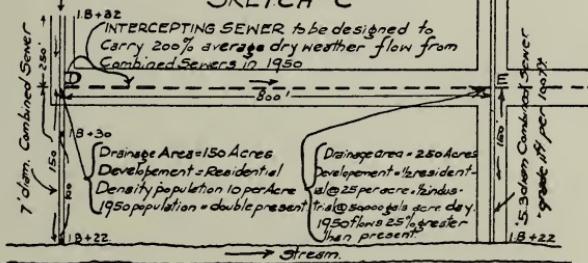
*Training and Experience—Weight 3.* NOTE:—In answering the questions on Experience, the statements made must be clear and concise, giving all dates necessary to show the length and character of experience. Any false statement made by the applicant in answering these questions will be regarded as good cause for excluding him from the eligible list, or for removal or discharge during probation or thereafter. 1. What is your age? 2. (a) What Grammar School did you attend? What grade were you in when you left Grammar School? (b) Give the names and locations of the High or Preparatory Schools you have attended,

SKETCH A.



SKETCH B.

SKETCH "C"



the length of time spent in each, and the course pursued. Dates of graduation or leaving school must be given. If you left school before graduation, state what class you were in when you left.

(c) What technical course have you pursued? Give the names of the schools, dates of entering and dates of leaving. If you have not been graduated, state the reasons and tell the class you were in and what subjects you covered before leaving.

3. What experience have you had in designing, detailing, and supervising building construction? State the positions held, salaries received, lengths of service, and dates of entering and leaving.

4. What experience have you had in an executive capacity?

5. From

what positions have you been discharged? For what causes? 6. Give the names and addresses of your employers whom you would be willing to have consulted as references. 7. State any other experience or training you have had that would tend to fit you for the position which you are now seeking.

*Practical Questions—Weight 5.* 1. (*Credit=14%*). You will assume that you are in charge of a squad of architectural draftsmen and have been assigned to prepare the Contract Drawings for the construction of a number of elevated railway passenger stations, located on private ground (not over bed of street), fronting on the street over which the railway runs and connected overhead by a passage to the station platform. (a) What data or information should you secure before beginning work on the plans? (b) Enumerate the different plans which in your judgment would be required to enable a contractor to prepare an intelligent bid and from which the stations could be constructed. (c) State the rules you would observe as to size of drawings, weight and character of lines, dimensions, notes, lettering and titles on the drawings. (d) What method would you suggest as being the surest check as to the accuracy of computations and of the subject matter of drawings? (e) On what class of drawings may colors be used and what purposes would you use them for? (f) Give briefly an effective system of numbering, indexing and filing drawings. (g) What obligations rest on a squad boss? 2. (*=2%*). Name the classical orders of architecture. 3. (*=3%*). State briefly the origin and development of the orders, giving the distinctive features of each order. 4. (*=3%*). Give the ratio of column length in terms of the diameter of column at its base or in modules for each order of architecture according to Vignola. 5. (*=8%*). What character of materials do you consider best adapted architecturally for the following types of construction: (a) For an elevated railway passenger station located on private property? (b) For an elevated railway station platform shelter? (c) For an entrance or exit stairway with its kiosk? (d) For station finish in a subway passenger station? 6. (*=2%*). Give the permissible bearing value on soils in tons per sq. ft. as per Phila. Building Code. 7. (*=5%*). Give the ultimate and safe working values for the following materials: (a) Medium open hearth steel. (b) Cast iron. (c) Yellow pine (long leaf). 8. (*=5%*). Give the allowable bearing pressure per sq. ft. on the following materials: (a) Stone concrete.

(b) Brick masonry in cement mortar. (c) Rubble masonry in cement mortar. 9. ( $=3\%$ ). What essential requirements are to be met in selecting the materials from which concrete is to be made? 10. ( $=5\%$ ). What proportion of mixture would you use for concrete for the following kinds of construction: (a) Large mass foundations? (b) Large girders reinforced with steel? (c) Thin wall and floor slabs reinforced with steel? 11. ( $=2\%$ ). What proportion sand and lime would you use for lime mortar for brick masonry? 12. ( $=2\%$ ). What proportion of sand and Portland cement would you use for cement mortar for brick or stone masonry? 13. ( $=3\%$ ). What are the requirements for the construction of buildings of the first class as provided by the Philadelphia Building Code? 14. ( $=3\%$ ). What are the essential points to be observed in designing entrance and exit stairways for subway stations? 15. ( $=3\%$ ). What details of design would you use to secure the safety of those who use the station stairways? 16. ( $=2\%$ ). What rise and tread would you use in designing a stairway for a subway station? 17. ( $=4\%$ ). Required the Section Modulus of a rolled steel beam supporting a concrete station floor, span of beam 15 feet, spacing 5 feet centers, concrete floor averages 6 inches in thickness. Assume weight of beam to be  $31 \frac{1}{2}$  lbs. per lin. ft., use live load specified by Philadelphia Building Code for places of public assemblage. Extreme fibre stress allowed for beam is 15,000 lbs. 18. ( $=6\%$ ). A station building measuring 16 ft. wide by 20 ft. long outside measurement has a rubble stone masonry foundation 4 ft. deep, the station walls are 13 in. and are of brick 12 ft. high, walls are capped with tile, deduct one door opening 6 ft. by 7 ft. high and 7 windows 3'-6" wide by 5'-6" high from walls, the floor is of concrete 6 in. thick, on this is laid 3 x 4 in. sleepers bedded with concrete and covered with a 7/8 in. tongue and groove floor 2 1/4 in. face, the ceiling height is 10 ft. the walls and ceiling are plastered, the ceiling is supported by 2 x 12 in. joists, the roof is of slag laid on 1" sheathing boards, and 8 in. base board with moulding extends around sides of room. Required the quantities of material to construct above building. 19. ( $=10\%$ ). Plan the central part of a subway passenger station, showing width of platform, arrangement of toilets, railings to control movement of passengers into and out of station, and of entrance and exit stairways. Consider the station to be centrally located about the intersection of two 60 foot streets in a busy section of the City on

a two-track subway sidewalk; 13 ft. wide subway tracks are 12 ft. centers and the edge of platform is 4 ft. 6 in. from the center of tracks. The depth from surface of street to under side of subway roof is 6 ft., from under side of roof to platform 10 ft. 6 in. and from platform to top of rail 3'-6". Make 1/8 scale plan of central section of station and elevation, make 1/4 scale section through a stair well showing the details of same. Letter and title drawing in an appropriate manner. 20. (=10%). Make a large scale rendered drawing showing a scheme of decoration or finish for the side walls of a subway station. The side walls will be assumed to be constructed of vertical 12 in. steel beams with concrete jack arches having a 9 in. rise, beams spaced 5 ft. 6 in., centers the height of the roof above the platform will be 10 ft. 6 in. Show elevation of wall and section through the "station finish." Letter and title drawing in an appropriate manner. 21. (=5%). Write a specification for materials and workmanship for the type of finish you have drawn in answer to Question #20.

*Oral Test—Weight 2.*

DRAFTSMAN, DEPARTMENT OF CITY TRANSIT, \$900—\$1,200 a year, September 18 and 19.

*Training and Experience—Weight 25.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 75.* Note:—The line work and lettering of the girder, and the spacing, ruling, and lettering of the two tables required below, are a test of the applicant's neatness and proficiency with pen and ink, and are to be arranged and executed in his best manner and in sizes adapted to actual use. 1. (*Credit=30%*). A steel plate girder in pier shed construction frames between two columns 48 ft. 0 in., c. to c., each made up of: 1 web 16 x 1/2 (16 1/2 in. b. to b. L<sup>s</sup>). 4 L<sup>s</sup> 6 x 3 1/2 x 5/8. At one end it frames centrally into the column web, at the other it frames centrally into the column flange, as this column is turned at right angles to the first. The girder is made up of: 1 web 64 x 3/8 (5 ft. 4 1/2 in. b. to b. L<sup>s</sup>. 4 L<sup>s</sup> 6 x 6 x 3/4. 1 cov. 14 x 1/2 x full length top and bottom. 1 cov. 14 x 7/16 x 27 ft. 6 in. top and bottom. 1 cov. 14 x 3/8 x 18 ft. 6 in. top and bottom. End reaction 210,000 lbs. Floor system consists of 9 20" 65 lb. I beams, web = 1/2 in. 6 ft. 0 in. c. to c., top of I 2 in. below back of top flange of angle of girder.

End reaction of each of two I beams framed opposite=30,000 lbs. I beams are coped on one side of both flanges so as to rivet directly on outstanding legs of stiffener angles. Intermediate stiffeners  $6 \times 3\frac{1}{2} \times 1\frac{1}{2}$  with fills. End stiffeners as required for detailing with reaction given. Flange rivet spacing in successive panels  $1\frac{3}{4}-2-2\frac{1}{2}-3\frac{1}{2}$  in. Make a detail drawing of this girder, ready for the shop, omitting portion not required to be shown by reason of symmetry. Compute and show column connections and beam connections (both for field rivets). Use  $\frac{3}{4}$  in. scale and finish in ink, on linen. Make on the same linen sheet a "bill of material" for ordering three such girders from the mill, and compute the weights ordered. Omit shop rivets. Make a bill of field rivets for three such girders (column and beam connections), adding  $1\frac{1}{2}$  in. to grip for ordered length.

*Data:* Area of  $\frac{3}{4}$  in circle = 0.4420 sq. in. Field rivet shear = 10,000 lbs. per sq. in. Shop 12,000 lbs. per sq. in. Field rivet bearing = 20,000 lbs. per sq. in. Shop 24,000 lbs. per sq. in. Gross area  $6 \times 6 \times 3\frac{1}{4}$  angle = 8.44 sq. in. Weight of  $12 \times 3/8$  plt. = 15.3 lbs. p. l. ft. 2. (=3%). A symmetrical Pratt truss with horizontal bottom chord and inclined end posts is 20.0 ft. deep at the first vertical ( $U^1L^1$ ), 25.0 ft. deep at the second vertical ( $U^2L^2$ ) and 25.0 ft. deep at the third vertical ( $U^3L^3$ ). Each of the six panels is 20.0 ft. long. There are no counters. Compute the lengths of all web and chord members and show them on a neat freehand sketch of the truss with the panel points lettered in the usual manner  $L^0-L^1-L^2-L^3, U^1-U^2-U^3$ .

3. (=4%). Two trusses such as described in (2) above are loaded by means of floor beams framed between the trusses at the bottom chord panel points, including the ends  $L^0$ . Distance c. to c. trusses = 16.0 ft. The floor beams in turn are loaded by two lines of stringers (which carry the track), located symmetrically about the center line of the bridge, and spaced 7.0 ft. c. c. (or 4.5 ft. from either truss). Make a neat freehand sketch of this system of trusses, floorbeams and stringers in plan. Assume that the entire floor system (including floorbeams and stringers) weighs 800 lbs. per lineal foot of bridge. Assume that each truss weighs 300 lbs. per lineal foot of bridge, the truss weight being applied half at upper and half at lower chord panel points. Find the total dead load end reaction and all dead load stresses in one truss. 4. (=7%). (a) One of the above stringers carries a single load of 20,000 lbs. Where should this load be placed for

maximum shear in the stringer? Find the amount of that shear. Where should this load be placed for maximum bending moment in the stringer? Find the amount of that bending moment. (b) What is meant by shear in a beam or girder and how does it affect the necessary dimensions of the beam or girder? What is meant by bending moment, and how does it affect the necessary dimensions of a beam or girder? In a plate girder, are the rivets fastening the flange angles to the web spaced closest together where the shear is greatest, or where the bending moment is greatest? Why is this? (c) One of the stringers defined in (2) above carries two loads of 10,000 lbs. each, spaced 8 ft. apart and capable of being rolled along the stringer. Where should these loads be placed for maximum shear in the stringer? (Show by sketch). Find the amount of that shear. Where should they be placed for maximum bending moment in the stringer? Find the amount of that bending moment. Find the ratio of this bending moment to that obtained by placing one of the two loads at the exact center of the stringer (and the other 8 ft. away). 5. ( $=3\%$ ). The double line of stringers defined in (2) above carries a series of axle loads of indefinite length, each 4,000 lbs. per axle (2,000 lbs. to a stringer), spaced uniformly 4.0 ft. c. c. of axles, and capable of being rolled along the stringers. Where should these loads be placed for maximum bending moment in one of the intermediate floorbeams? Find the value of this bending moment. Where should they be placed for maximum end reaction of a truss on its support? Find the value of this reaction. Where should they be placed for maximum stress in hanger U-L? Find the value of this stress. NOTE:—In all the above questions, if you cannot answer the entire question, be sure to answer all you can. 6. ( $=4\%$ ). In a triangle ABC, side AB = 40 ft. 6 5/8 in. — Natural sine of  $20^\circ$  = 0.34202. Side AC = 42 ft. 4 1/2 in. Natural cos.  $20^\circ$  = 0.93969. Angle BAC =  $20^\circ$ . Compute the side BC to three decimal places and reduce to feet and inches. Find the "bevel" in 12 inches of AB with respect to AC. 7. ( $=4\%$ ). At a bottom chord panel point of a Pratt truss assume the following data: Stress in vertical post = 22,000. lbs. compression. Section 2 angles 5 x 3 1/2 x 3/8 b. to b. Stress in diagonal = 32,000 lbs. tension. Section 2 L<sup>s</sup> 3 1/2 x 3 1/2 x 3/8 b. to b. Inclination of diagonal 45 degrees. Stress in bottom chord = 80,000 lbs. on one side of point. Section 2 L<sup>s</sup> 6 x 3 1/2 x 3/8 b. to b. Stress in bottom chord = 100,000 lbs.

on other side of point. Section 2 L<sup>s</sup> 6 x 3 1/2 x 3/8 b. to b. with 1 cov. 8 x 3/8. Detail this joint in an efficient and economical manner, using what you consider usual values for rivets. Give computations. Assume all shop rivets. Draw in pencil to 3/4 in. scale. 8. (=6%). A 15 in. I beam with a section modulus  $\frac{I}{c}$  of 65 is used on a 15 ft. span to carry two equal concentrated loads placed at the third points. Find what these loads will be to give a unit stress of 16,000 lbs. per sq. in. on extreme fibre. 9. (=7%). The area of a circle 3/4 in. diameter is 0.4420 sq. in. What is the single shear value of a field rivet, if the specification allows 12,000 lbs. per sq. in. shearing stress on shop rivets with 25 per cent excess in number required for field rivets? If the specification further allows 24,000 lbs. per sq. in. bearing stress on shop rivets, how thick must a plate girder web be in order that the shop rivets in the flange may be spaced for double shear value? 10. (=9%). Make a neat sketch of a reinforced concrete beam 16 in. deep by 10 in. wide, resting on walls 12 ft. apart in the clear; indicate the approximate location of the steel reinforcement to take care of tensile and shearing stresses. Indicate about what the area of cross section of this steel reinforcement would be for a usual beam of such a size. Make a sketch of two such beams, resting at the outer ends on walls, but the inner ends framing opposite each other into a reinforced concrete girder 24 in. wide by 32 in. deep, tops of beams and girders flush, 12 ft. clear between wall and girder. Indicate the approximate location of the steel reinforcement in the beams, if they are figured as continuous over the girder. Why is it economical to figure the beams as continuous in such a case, and what additional steel is necessary to make them so? 11. (=9%). Compute the moment of inertia of a rectangular wooden joist 4 in. wide by 8 in. deep, with reference to horizontal axis. How many feet board measure in such a joist 8 ft. long? What are the lengths in which such a joist can usually be purchased out of lumber yard stock? What total uniform load will such a joist safely carry on supports 13 ft. c. c., using 1,200 lbs. per sq. in. extreme fibre stress? 12. (=14%). A steel column carries 360,000 lbs. total load. This is transmitted by a steel base plate to a concrete pedestal which in turn is carried on wooden piles. Draw a careful sketch, approximately to scale, in front and side elevation and plan (at different levels as necessary) of the column base, concrete pedestal, and pile tops, using your judgment as to

proportions, giving all dimensions and sizes of material, and observing the following requirements: Unit stress in steel column shaft 10,000 lbs. per sq. in. One-third of column load transmitted to base plate by milled shaft, balance by  $3/4"$  rivets. Single shear value of 1 rivet = 5,400 lbs. Bearing of plate on concrete 600 lbs. per sq. in. No appreciable tension on concrete. Supporting power of 1 pile = 12 tons. Piles not closer than 3 ft. in any direction.

DRAFTSMAN, CITY TRANSIT AND WHARVES, DOCKS AND FERRIES, \$1,200-\$1,500 a year, September 18 and 20.

*Training and Experience—Weight 3.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 7.* For Questions 1 to 7, see Questions 1 to 7, examination for Draftsman, held September 18 and 19.

8. (*Credit=7%*). A beam 21 ft. long carries concentrated loads as follows: 6 ft. from left end, 2,000 lbs. 12 ft. from left end, 4,000 lbs. 18 ft. from left end, 3,000 lbs. Compute the end reactions and draw to approximate scale, freehand, the shear diagram. Compute the required section modulus  $\frac{1}{c}$  for such a beam, the above loading to produce maximum unit bending stress on extreme fibre of 12,000 lbs. per sq. in. 9. ( $=6\%$ ). Two 8 in. I beams (webs 0.27 in. thick), frame opposite each other, into a girder web  $3/8$  in. thick. Max. end reaction of one I beam = 17,000 lbs. Max. combined reaction of two I beams = 34,000 lbs. Area of  $3/4$  in. rivet = 0.4420 sq. in. Shear allowance, 12,000 lbs. per sq. in shop, 1,000 lbs. per sq. in. field. Bearing allowance, 24,000 lbs. per sq. in. shop, 2,000 lbs. per sq. in. field. Sketch freehand the connection on the beams and on the girder, using standard hitch angles, but adding fillers wherever required for bearing value. Give computation. 10. ( $=9\%$ ). A reinforced concrete beam is required to carry, in addition to its own weight, a uniform load of 800 lbs. per lineal foot and two concentrated loads of 4,000 lbs. each, at the one-third points. Length of beam, c. c. bearings, 20 ft. 0 in. Make a trial design by approximate methods, giving computations and freehand sketch. Do not exceed 16,000 lbs. per sq. in. tension on steel, 600 lbs. per sq. in. compression on concrete, 50 lbs. per sq. in. shear on concrete. Assume  $n = 15$ . 11. ( $=9\%$ ). What is the moment of inertia of a hollow rectangular section, the out-

side dimension 8 in. by 16 in., the inside dimension 6 in. by 14 in., with reference to an axis bisecting the short sides? What is its least radius of gyration? What is its carrying capacity as a column, using the formula  $p = 16,000 - 70 \frac{1}{r}$  and assuming  $1 = 12$  ft. 12. ( $=14\%$ ). Give design and sketch of a reinforced concrete foundation slab to transmit a column load of 360,000 lbs. over a soil capable of supporting 6,000 lbs. per sq. ft. Unit pressure of steel column base on concrete 600 lbs. per sq. in. Assume neutral axis in center of slab.

Assume  $f_s = 16000$

$$f_c = 600$$

$$n = 15$$

DRAFTSMAN, CITY TRANSIT AND WHARVES, DOCKS AND FERRIES, \$1,500-\$1,800 a year, September 18 and 21.

*Training and Experience—Weight 35.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 65.* For Questions 1 to 7, see Questions 1 to 7, examination for Draftsman, held September 18 and 19.

8. (*Credit=6%*). Three axle loads of 12,000 lbs. each are spaced, 8 ft. between the first and second, 6 ft. between the second and third. Place these axles on a pair of stringers 22 ft. long, one-half the axle load on each stringer, so as to produce maximum bending moment. Compute this moment. Assuming also 300 lbs. dead load per lineal foot of one stringer, find the required section modulus for maximum combined dead and live load bending, extreme fibre stress to be 16,000 lbs. per sq. in. 9. ( $=9\%$ ). A plate 24" x 1 1/4 in. is used as a tension member, assuming four holes out (net area =  $20 \times 1 \frac{1}{4}$ ). Detail a shop splice (two symmetrical lap plates) to develop 20% excess strength in splice material and rivets at every point of the splice. Give all calculations to prove sufficiency.

Use 7/8" rivets. Area = .6010 sq. in.

Tensile stress	= 16,000 lbs. per sq. in.	} Not including the required 20% excess.
Shearing stress	= 12,000 lbs. per sq. in.	
Bearing stress	= 24,000 lbs. per sq. in.	

10. ( $=6\%$ ). What assumptions are made, according to the Philadelphia Building Code, in order to derive flexure formulas for reinforced concrete beam design? Draw a sketch and show

how those assumptions enable you to derive the formula for  $K$  in terms of  $n$ ,  $f_s$  and  $f_c$  where

$d$  = depth to steel

$k$  = depth to neutral axis

$f_s$  = unit stress in steel (average)

$f_c$  = unit stress in concrete (extreme fibre)

$n$  = ratio of section moduli  $\frac{E_s}{E_c}$

11. (=9%). A rolled steel H. section comprises two flanges each 14 in. wide by 2 in. thick, joined by a web 12 in. by 1 in. (total depth = 16 in.). It is used as a column, with unsupported length of 22 ft. parallel to web and 11 ft. normal to web. What is its safe load, using the column formula of either the Philadelphia Building Code, the New York Building Code, or the American Railway Engineering Association (state which of these formulas you use). 12. (=15%). A concrete wall column 18 in. square carries 60,000 lbs. live load and 80,000 lbs. dead load.

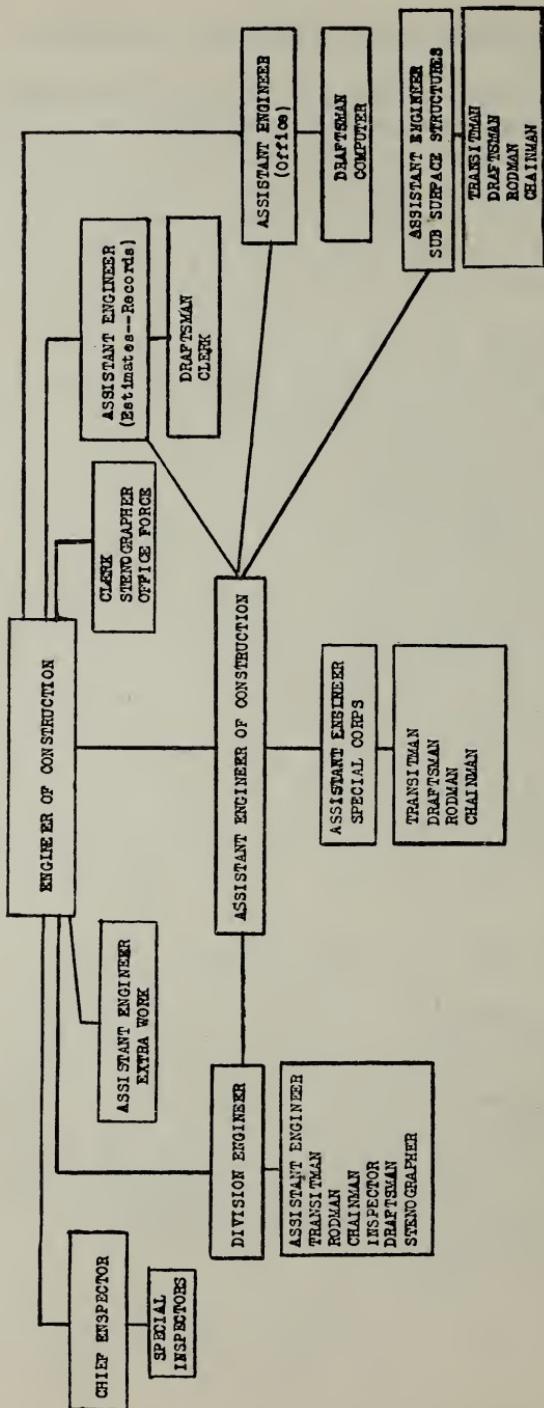
Center of column is 9 in. from party line, hence face of column is on party line and no construction can extend over same. The nearest interior column is 16 ft. away, c. to c. Design a cantilever girder and footing, to support this column with a foundation pressure not exceeding 4,000 lbs. per sq. ft. Use Philadelphia Building Code values for unit stresses. Sketch the girder and footing in detail, also the footing under the interior column, assuming that the latter has its own dead load of 130,000 lbs. and live load of 90,000 lbs.

DIVISION ENGINEER, DEPARTMENT OF CITY TRANSIT, \$2,400-\$2,700 (inc.) a year, September 19 and 20.

*Training and Experience—Weight 4.* For Questions 1, 2, 6, 7, 8 and 9, see Questions 1, 2, 4, 5, 6 and 7, examination for Architectural Engineer, held September 18 and 19. 3. How many years' practical experience have you had since leaving school? Explain fully, stating where you have been employed, the names of your employers, dates of entering and dates of leaving their employ, the reasons therefor, the salaries received and the nature of the work you performed. In each case, state whether your work was in the office or in the field. 4. Have you ever been in responsible charge of heavy construction work? If so, give full details, including the length of service. 5. State your experience as an organizer on construction work.

*Practical Questions—Weight 3.* 1. (*Credit=20%*). Give concise specifications covering the principal items of work entering into the construction of subways and elevated railways, or structures comprising similar classes of materials and workmanship. 2. (*=15%*). Show by sketches and describe the cut and cover method of trench work for a subway in a congested city street. Include details of the system of timbering you would recommend; also the main features of the type of contractor's plant that would be most suitable for this class of work. 3. (*=10%*). How would you determine the limits of the underpinning of the adjacent buildings made necessary by construction of a subway? Explain the various steps in an underpinning operation of this character. 4. (*=25%*). Subway construction as it is now contemplated to be carried out by the City will be organized in accordance with the accompanying chart. The different lines will be divided into sections covering work to the amount of between \$2,000,000 and \$3,000,000 each. Over each section will be placed a Division Engineer reporting to the Engineer of Subway Construction. Give in full detail what you understand will be the duties devolving upon the position of Division Engineer and what you consider should be the proper size of the administrative and engineering office force of this office; how all records should be kept, assuming that the sections will be let on a unit price basis, and all records must be so kept as to satisfy the City requirements. Outline the duties of all the subordinates in the Division Engineer's office, and state the method of arriving at the size and number of corps that would be required on the work. State what you understand should be the duties of the engineer in relation to the City and the contractor. 5. (*=30%*). Describe as completely as possible some piece of heavy construction work with which you have been connected in a similar capacity. Give a full description of the administrative and engineering organization engaged on that piece of work and the methods employed in the execution of the work. State fully what you consider were the good or bad methods used by the contractor in carrying out this work, and state fully the reasons why you consider the methods used good or otherwise.

*Oral Test—Weight 3.*



ARCHITECTURAL DRAFTSMAN, DEPARTMENT OF CITY TRANSIT,  
\$1,200-\$1,500 a year, September 19 and 21.

*Training and Experience—Weight 3.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 7.* 1. (*Credit*=2.5%). Name the orders of architecture as given by Vignola. 2. (=2.5%). Make a diagram of a Roman order in which the height of column is 8 diameters or 16 modules, naming the parts and mouldings entering into its composition. 3. (=5%). Define the following architectural terms: (a) Tympanum; (b) lunette; (c) spandrel; (d) pendentive; (e) peristyle; (f) mutule; (g) modillion; (h) gargoyle; (i) orientation; (j) pylon. 4. (=2.5%). Illustrate by a sketch the method of finding the entasis of a classical column. 5. (=2.5%). What particular type or style of architecture is represented by each of the following Philadelphia buildings: (a) The Custom House on Chestnut street; (b) the Girard Trust Building at Broad and Chestnut streets; (c) the City Hall; (d) Independence Hall; (e) Girard College? 6. (=2.5%). Draw a freehand section through a floor of a second-class building, as defined by the building code, showing columns, caps, base, girders, floor, etc. Name the character of the materials. 7. (=7.5%). To what uses are the following materials best adapted in Subway and Elevated Station construction: (a) Indiana limestone; (b) ceramic tile; (c) polychrome terra cotta; (d) terrazzo; (e) hollow tile; (f) tapestry brick; (g) Vermont marble; (h) concrete; (i) pressed steel; (j) copper? 8. (=2.5%). Show, by a sketch, a method of supporting and anchoring a Corinthian terra cotta cornice having a projection and depth of three feet on an 18-inch brick wall. 9. (=2.5%). Show by sketch a method of protecting a 12-inch rolled steel beam used in the floor of a building of the first class. Name the materials used and their thickness. 10. (=5%). In your judgment, what would be a satisfactory rise and tread for a stairway in each of the following types of building: (a) An ordinary dwelling; (b) a tower fire escape for a factory; (c) a place of public assembly? Give a rule for proportioning the rise and tread for a stairway. 11. (=10%). The length of a building with a plain roof is 32 feet, the width is 24 feet, the height of the gables is  $\frac{5}{8}$  of the width. The roof projects over the walls 15 inches (measured on the roof) at the ends and eaves. (a) How many squares (100 sq. ft.) of slating in the roof area? (b) The slates being 12 inches wide

and exposed  $8\frac{1}{2}$  inches to the weather, how many will be required per square? 12. ( $=5\%$ ). Define the term "Architecture" in a brief description not exceeding 150 words. 13. ( $=35\%$ ). Make a rendered drawing of an entrance doorway appropriate for a Passenger Station, opening 8 feet between jambs, semi-circular head, flanked on each side with an order of architecture. Indicate marquee, using brick, stone, terra cotta, wood, cast iron or other appropriate materials. Required  $\frac{3}{4}$ -inch scale. Full elevation, plan and vertical section. Indicate materials and letter title in an appropriate manner. 14. ( $=15\%$ ). Make a large scale freehand perspective sketch in color of a Corinthian console or bracket, view taken looking up, showing an acanthus leaf on under side. Title in an appropriate manner.

SQUAD BOSS, DEPARTMENT OF CITY TRANSIT, \$2,000-\$2,200 (inc.) a year, September 19 and 21.

*Training and Experience—Weight 3.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 5.* 1. (*Credit=14%*). You will assume that you are in charge of a squad of draftsmen, and have been assigned to prepare the contract drawings for the construction of a section of two-track subway  $\frac{1}{2}$  mile in length in which there will be a station 550 ft. long, with the necessary entrances and exits. (a) What data or information should you secure before beginning work on the plans? (b) Enumerate the different plans, which, in your judgment, would be required to enable a contractor to prepare an intelligent bid, and from which the subway could be constructed. (c) State the rules you would observe as to size of drawings, weight and character of lines, dimensions, notes, lettering and titles on the drawings. (d) What method would you suggest as being the surest check as to the accuracy of computations and of the subject matter of drawings? (e) On what class of drawings may colors be used, and what purposes would you use them for? (f) Give briefly an effective system of numbering, indexing and filing drawings. (g) What obligations rest on a squad boss? 2. ( $=6\%$ ). State briefly the uses to which the following materials are best adapted in subway and elevated railway construction: (a) Crushed stone; (b) rolled steel shapes; (c) cast iron; (d) yellow pine; (e) asphalt; (f) steel rods; (g) vitrified clay pipe; (h) Portland cement; (i) piles; (j) concrete. 3. ( $=3\%$ ). Give the bearing value of soils in

tons per sq. ft. as permitted by the Philadelphia Building Code. 4. ( $=3\%$ ). In designing wood pile foundations, what general conditions must be observed? What load may be placed on each pile as permitted by the Philadelphia Building Code? 5. ( $=3\%$ ). Give the ultimate and safe working values for the following materials: (a) Medium open hearth steel; (b) cast iron; (c) long leaf yellow pine. 6. ( $=3\%$ ). Give the bearing pressure allowed on the following materials: (a) Stone concrete; (b) brick masonry in cement mortar; (c) rubble stone masonry in cement mortar. 7. ( $=3\%$ ). What essential requirements are to be observed in selecting the materials from which concrete is to be made? 8. ( $=3\%$ ). What proportion of mixture would you use for concrete for the following kinds of construction: (a) Large mass foundations; (b) large girders reinforced with steel; (c) thin wall and floor slabs reinforced with steel? 9. ( $=6\%$ ). Required the Section Modulus and End shear for a rolled steel beam supporting a subway roof, length of span 15 ft., spacing of beams 5 ft. 6 in. centers, average thickness of concrete roof of subway 18 in., depth of each cover from top of roof to surface of paving is 5 ft. Use live load of 25,000 lbs. applied over a surface of street of 2 ft. square, and assume the load to be distributed in all directions on slope equal to one-half of depth, allowable fibre stress on steel beams embedded in concrete. Show by sketch the placing and distribution of the live load, and state the unit weights used for concrete roof and earth cover. 10. ( $=4\%$ ). Compute the number of pounds of steel, the bags of cement and the cubic yards of sand and broken stone required to lay a reinforced concrete floor slab 100 ft. square by 1 ft. thick, concrete to be 1-2-4 mixture, proportion of steel for reinforcing 6/10 per cent., for shrinkage 15/100 per cent. 11. ( $=3\%$ ). A subway car is 50 ft. long by 8 ft. 6 in. wide, and the tracks are spaced 36 ft. centers. In passing around a curve having a radius of 200 ft., what will be the overhang of the corner of the car? Corners of car assumed to be not rounded. 12. ( $=5\%$ ). Describe the two types of transition curves that are used to connect tangent tracks with simple curves. 13. ( $=4\%$ ). What effect has the transition curve on the operation of trains? 14. ( $=10\%$ ). A main sewer crosses the line of a subway between the floor and roof lines, the grade of the subway cannot be changed, describe two methods by which the sewer may be deflected, and state the advantages of each method. 15. ( $=15\%$ ). Design a reinforced concrete re-

taining wall for a bank 24 ft. high, pressure acting against back of wall equivalent to a fluid weighing 25 lbs. per cu. ft., concrete to be 1-2-4 mix, ratio of moduli of elasticity of concrete to steel 1 to 15, compression on concrete 600 lbs. per sq. in., tension on steel 16,000 lbs. per sq. in., shearing stresses for diagonal tension resisted by steel 150 lbs. per sq. in., for diagonal tension not resisted by steel 40 lbs. per sq. in. Required a  $\frac{1}{2}$ -in. scale cross section of wall, showing reinforcement and full dimensions, show force diagram on section from earth pressure, also show the pressure on soil for front and back toes of footing. 16. ( $=15\%$ ). An elevated railway column is composed of 1 Beth. H. section  $84\frac{1}{2}$  lbs. per foot, and 2—18-inch channels at 45 lbs. per ft., the gross area of section is 51.4 sq. in., the load carried by the column is 820,000 lbs., the thickness of the web of the H is .51 inch and of the flanges .75 inch, web of 18-in. channels is .47 inch, width of flange is 3.77 inches. Required a  $1\frac{1}{2}$ -inch scale finished detail drawing of a base for the above column, using 400 lbs. per sq. in. bearing on pier,  $\frac{7}{8}$ " diam. rivets and 11,000 lbs. per sq. in. shear and 22,000 lbs. per sq. in. bearing on rivets. Give bill of material, dimension and title drawing in an appropriate manner. Consider column base fixed by anchor bolts, note size of bolts and size of holes for same.

*Oral Test—Weight 20.*

ARCHITECTURAL DRAFTSMAN, DEPARTMENT OF CITY TRANSIT, \$1,500-\$1,800 a year, September 19 and 22.

*Training and Experience—Weight 35.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 65.* 1. (*Credit=2.5%*). Name the orders of architecture as given by Vignola. 2. ( $=2.5\%$ ). Give the height of the column in the terms of the diameter at the base or in the modules for each order of architecture. 3. ( $=5\%$ ). Define the following architectural terms: (a) Dado; (b) Volute; (c) Taenia; (d) Stylobate; (e) Reglet; (f) Proscenium; (g) Fenestration; (h) Cyma recta; (i) Atlantes; (j) Impost. 4. ( $=2.5\%$ ). Draw an outline sketch of an arch, and indicate on it the essential subdivisions or parts of which it is composed. 5. ( $=5\%$ ). Sketch a 10-inch diameter cast-iron column  $\frac{3}{4}$ -inch thickness of metal, showing 10-inch rolled beams framed to column, with top of beams flush with column top. Assume load on column of 200,000 lbs. Design base of column for bearing on

concrete, and design a concrete footing for bearing on good gravel, using Philadelphia Building Code Loading. 6. ( $=5\%$ ). Describe the character of construction required by the building code (Philadelphia) for the following classes of buildings: (a) buildings of the first class; (b) buildings of the second class; (c) buildings of the third class; (d) buildings of the fourth class. 7. ( $=5\%$ ). What live loads are permitted by the Philadelphia Building Code on floors of the following classes of buildings: (a) dwellings; (b) office buildings; (c) places of public assembly; (d) manufactories? 8. ( $=2.5\%$ ). Name and describe three bonds used in laying up brick walls. 9. ( $=2.5\%$ ). Name 10 species of wood most commonly used for construction and finish of buildings. State the uses each species is best adapted for. 10. ( $=5\%$ ). Write a brief specification for applying ceramic tile as a decoration or finish to the concrete walls and ceiling of a subway station. 11. ( $=7.5\%$ ). The waiting room of an elevated station is 20 feet long by 12 feet wide by 10 feet high. The rear 20 ft. wall contains 3 windows, 3 ft. wide by 5 ft. high, set 2 ft. 6 in. from floor to sill. The front 20 ft. wall contains three doors, 3 ft. wide by 7 ft. 6 in. high, the walls to have a tile wainscoting 4 ft. 6 in. high; the walls and ceiling to be plastered. The floor is  $\frac{1}{2}$ -in. tongue and groove boards, 2 in. face, laid on 3 in. by 4 in. sleepers, laid 16-in. centers, bedded in cinder concrete. (Trim around doors and windows 6 in. wide.) Estimate the square yards of plaster, the square feet of the wainscot, the feet (board measure) of flooring and of sleepers, and the cinder concrete required to lay the floor. 12. ( $=5\%$ ). Define the term "Architecture" in a brief description not exceeding 150 words. 13. ( $=40\%$ ). Make a rendered elevation of a station building for an elevated railway, the building to be located at a street intersection on lot fronting the railway 25 ft. wide by 50 ft. depth on the intersecting street, top of station platform 24 ft. above curb. Building to be constructed of brick, stone, terra cotta and tile roof. Draw  $\frac{1}{8}$ -inch scale plans of station floor level and street level, showing stairways, waiting rooms, toilets, entrances and exits. Required both street elevations  $\frac{1}{4}$ -in. scale. Letter and title in appropriate manner. 14. ( $=10\%$ ). Make a freehand perspective sketch to large scale, showing in detail an Ionic capital with diagonal volutes, showing part of shaft and entablature, view looking up, render in color. Letter and title in appropriate manner.

LABORATORY ASSISTANT (PHYSICAL), ANY BUREAU, ANY DEPARTMENT, \$1,200 a year, October 23.

*Training and Experience—Weight 4.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 6.* 1. (*Credit=5%*). (a) Define and explain: Mass, density, force, weight, physical change and chemical change. (b) (*=5%*). The state in which a body exists depends on what? Show, by example, how changes in these conditions affect various substances. 2. (*=10%*). Define and discuss, giving examples, cohesion, adhesion, elasticity, compressibility, flexibility, hardness, brittleness, viscosity, ductility and malleability. 3. (*=5%*). (a) Define specific gravity. Describe method for determination of specific gravity of a solid. (b) (*=10%*). State Newton's Laws of Motion. 4. (*=10%*). Describe the different methods by which heat is transferred from one body to another. What are the effects of heat? How is the quantity of heat measured? 5. (*=15%*). Briefly describe the production methods used for Portland cement, concrete, cast iron, wrought iron and steel. State a few uses for which each of the above materials are particularly adapted, and give reasons. 6. (*=15%*). Discuss the behavior of a specimen of ductile steel tested under tension to rupture. Given the following data of a tensile test, calculate the customary results: Diameter, 0.76"; load at yield point, 15,800 lbs.; maximum load, 26,330 lbs; elongation in 8", 2.36"; diam. at fracture, 0.47". 7. (*=10%*). Define modulus of rupture. The following is the data for test of a building brick. Calculate the customary results: Transverse—Span 7", size 8 1/16" x 3 15/16" x 2 1/8"; breaking load, 1,875 lbs. Compression—Size, 3 15/16" x 4 1/8"; breaking load, 87,960 lbs. Absorption—Original weight, 1,076 grams; weight after immersion, 1,164 grams. 8. (*=15%*). Make a freehand sketch of a six arm 12" cast-iron pulley, with crowned face. 3" face, 1 3/16" bore, 3/8 keyway, hub 3" diam. and 4" long. Show dimensions, finish marks, etc.

CHIEF DRAFTSMAN (SEWER PLANS DIVISION), BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS, \$2,000 a year, October 23 and 24.

*Training and Experience—Weight 35.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 65.* 1. (*Credit=15%*). (a) De-

tail the procedure in designing a system of storm-water sewers for a watershed within the borders of a municipality. (b) Describe, in detail, the "Philadelphia Formula" for calculating stormwater runoff. (c) Outline the "Concentration (or Rational) Theory" for calculating stormwater runoff, and state what information is required for intelligent application. 2. (=12%). (a) Give in detail an accepted formula for calculating the size of sewer necessary to discharge a calculated runoff. (b) What size circular brick sewer, running full, will be required to drain an area of 300 acres if the average surface slope of the area is 12 feet per thousand feet and the grade of the sewer is 0.9 feet per hundred feet? The intensity of rainfall is assumed to be 3 inches per hour, and the amount of runoff is 75% of the rainfall. 3. (=8%). (a) What system of drainage should you use for collecting the runoff from an area wherein the stormwater outlet cannot be used for sewage? Describe such a system briefly. (b) Outline the conditions governing the design of an inverted siphon for carrying the sewage flow from an area in process of development. 4. (=12%). (a) A force main is required to carry 2,000,000 gallons in 24 hours. It is 5,000 feet long and the outlet is 50 feet higher in elevation than the intake. What size main would you use, and what considerations governed your choice? (b) What shaft horsepower would be required for a centrifugal pump to deliver the above quantity through the force main selected? 5. (=13%). (a) What information should appear on a main sewer plan? (b) Describe the method you would use in filing and indexing the plans and records of the drainage systems of a large city? 6. (=40%). (a) Design a reinforced concrete, box section sewer, 10 feet horizontal and 8 feet vertical, inside dimensions. The soil in which it is to be built is safe under a pressure of 3 tons per square foot. The cover over the outside top is earth fill 4 feet deep, and the assumed live load is 10 tons applied on one wheel. Stresses allowable: Steel, 16,000 lbs. per sq. in.; concrete, 600 lbs. per sq. in., extreme fibre;  $n = 12$ . Concrete to take no tension. (b) Make a detail cross section of this sewer to  $\frac{1}{2}$ " scale. (c) Estimate the cost of construction for a length of 100 feet, using prices for labor and materials which, in your judgment, are current for the vicinity of Philadelphia.

ARCHITECT, DEPARTMENT OF WHARVES, DOCKS AND FERRIES, \$1,800 a year, October 23 and 24.

*Training and Experience—Weight 2.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 5.* 1. (*Credit=10%*). What materials of construction are adaptable to harbor structures in the following portions of the building: Below low water; above low water; between low water and the street deck; floors; curtain walls; windows with reference to percentage of light, and a roof of fireproof construction? 2. (=4%). (a) Explain briefly the theory of perspective. Outline generally two methods of obtaining perspectives. (b). (=6%). What are the meanings of the terms archivolt, intrados, extrados, Bush or patent hammered finish, cement finish, parapet wall? 3. (=10%). Sketch, freehand, details of the following: A metal double-hung sash; a steel sash set in steel framing; a plaster partition on metal siding, taking this section through a doorway opening. These sketches must be neatly lettered and all architectural terms descriptive of the separate portions of the construction noted. 4. (=4%). (a) The resisting modulus of a 15-inch I-beam ( $\frac{1}{e}$ ) is 60, the span is 21 feet; what uniform safe load will it sustain, using the unit stress of 16,000 pounds per square inch? (b). (=4%). Assume that a timber girder 12" x 12" with a 21-foot span carries two vertical loads placed at the third points, using a unit stress of 1,200 pounds, what loads would the girder sustain? (c) (=2%). Assume two forces meeting at a point; determine their resultant. 5. (=4%). (a) Name several materials of building construction that are acceptable to architectural treatment in the offshore façade of a pier. Give the reasons for your selection. (b) (=2%). Name two materials which are not acceptable, with the reasons for your decision. 6. (=25%). Write a short thesis upon the theory of design as applied to piers and other terminal industrial structures, as warehouses, factories, etc., applicable to the Philadelphia Harbor and Philadelphia practice. Sign this "John Doe." 7. (=10%). Write a concise and brief specification, noting only the salient features in the construction, for a façade of a river pier building of concrete, with a Bush or patent hammered face, the door openings being fitted with rolling doors, and the window openings with steel sash. 8. (=15%). Sketch, freehand, a cross section of a complete pier, showing type of foundations and type of superstructure, the design to be a

permanent type of construction with a two-story shed. Total width of pier 180 feet, with two railroad tracks on first deck.  
9. ( $=4\%$ ). Sketch a cross section of a concrete bulkhead on timber piles and a cross section of a solid timber crib bulkhead.

*Drawings to be submitted—Weight 3.*

ASSISTANT SUPERINTENDENT (HIGH PRESSURE STATIONS), BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$1,500 a year, October 24.

*Training and Experience—Weight 3.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 7.* 1. (*Credit=8%*). Give a brief description of the Philadelphia High Pressure System, including number, location and equipment of pumping stations and the outlines of the territory covered. 2. ( $=12\%$ ). Make a sketch of the Race street district, showing streets occupied by the High Pressure mains, with their respective sizes. 3. ( $=8\%$ ). Give the diameters of two of the largest sized pipe in the Fairhill District, and on what streets are they located? 4. ( $=8\%$ ). To what pressures are the pipe subjected: (a) At the foundry; (b) after being laid in street; (c) in fire service? 5. ( $=8\%$ ). What type of joints are in use on the High Pressure mains? Make a sketch of each. State the kind of material of which the pipe is composed. 6. ( $=8\%$ ). Mention the different types of hydrants in use on the High Pressure System and write a brief description of one. 7. ( $=8\%$ ). Give the direction and number of turns required to open the line valves of the various sizes; also fire hydrants. 8. ( $=8\%$ ). What is the average pressure on the mains when the pumps are not operating and how is it maintained? 9. ( $=8\%$ ). Describe a method of repairing a break on a High Pressure pipe. 10. ( $=8\%$ ). If a break occurs on the mains without surface indication, how would it be located? 11. ( $=8\%$ ). Describe briefly what action is taken at the High Pressure Station when an alarm of fire is sounded. 12. ( $=8\%$ ). Give your idea of an organization suitable for operating and maintaining the High Pressure System of the City of Philadelphia.

ASSISTANT ENGINEER, BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$1,800 a year, October 24.

*Training and Experience—Weight 3.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 5.* 1. (*Credit=10%*). (a) On the attached blue print, sketch the line of a 16-ft. wide road, from State Highway to the building; the road to be used for heavy hauling. Describe briefly the method you would use to obtain economy in grading. (b) (*=10%*). State the essential parts of specifications for grading this road. Do not attempt to write complete specifications. 2. (*=10%*). (a) It is intended to grade "A" street and it is not desirable to have slopes in the cut. Design a gravity section retaining wall for the maximum cut. Assume backing to be gravel weighing 110 pounds per cubic foot, having an angle of repose ( $\phi$ ) of  $35^\circ$   $\left\{ \frac{1 - \sin \phi}{1 + \sin \phi} = .27 \right.$

P = total horizontal pressure per linear foot of wall

h = height of wall

w = weight of backing

$$P = \frac{wh^2}{2} \left\{ \frac{1 - \sin \phi}{1 + \sin \phi} \right\}$$

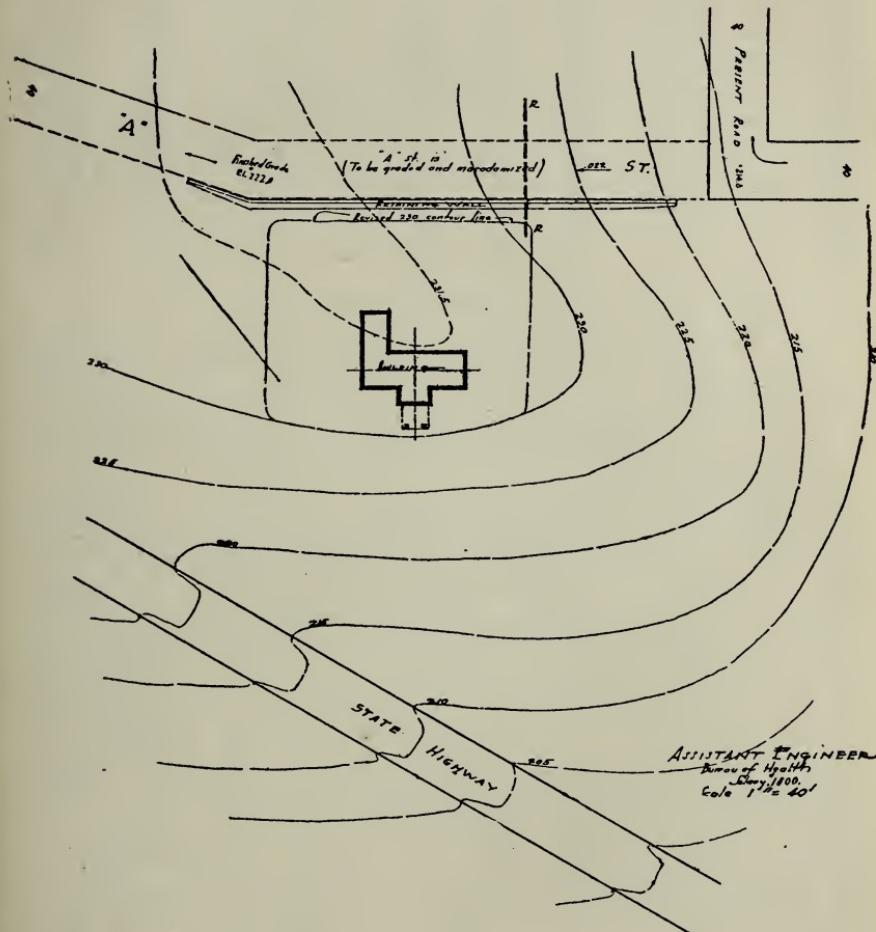
(*Credit=10%*). (b) State the essential parts of specifications for constructing the wall. Do not attempt to write complete specifications. 3. (*=5%*). Complaint has been made that after heavy rainstorms the cellars of a certain block of houses are flooded. What matters would you investigate in order to make a report thereon? 4. (*=5%*). Complaint has been made that there is an insufficient water supply in a certain block of houses. What matters would you investigate in order to make a report thereon? 5. (*=5%*). What are the essentials required for proper ventilation of a building? How may these requirements be obtained? 6. (*=5%*). If certain lumber costs \$40 per M. ft. B.M., how much will 125 pcs. 2" x 10" x 16' and 18 pcs. 8" x 10" x 12' cost? 7. (*=5%*). Describe two methods for carrying a survey line past a building and also two methods for carrying the stations past the obstruction. 8. (*=5%*). What should be the dimensions and number and size of rods in a reinforced concrete beam, span 8 ft., total uniformly distributed load of 2,000 lbs.? Assume  $f_s = 15,000$ ;  $p = .0075$ ;  $j = .875$ ;  $M = f_s p j b d^2$ . 9. (*=5%*). Describe briefly the modern processes of water purification. 10. (*=5%*). An institution with 5,000 population is located on the watershed of a stream in Pennsylvania, 4 miles above the intake of a water works. Give a concise description of the method you

SEP 25 1919

EXAMINATION QUESTIONS FOR 1916.

149

would propose to treat the sewage from said institution before it is discharged into this stream. 11. (=10%). Prepare at home and return in three days a diagram suitable for a popular exhibit, showing the data given on attached table (page 150). Use tracing cloth, size some multiple of 8 1/2" x 11". 12. (=10%). Make



(Question No. 11, page 149.)

## TYPHOID FEVER

## DEATH RATES PER 100,000 OF POPULATION

Year	Total Deaths	Rate	Year	Total Deaths	Rate
1880	498	58.7	1898	639	51.3
1881	645	74.2	1899	948	74.6
1882	650	73.1	1900	449	34.6
1883	579	63.7	1901	444	33.6
1884	662	71.3	1902	588	43.6
1885	610	64.3	1903	957	69.7
1886	618	63.8	1904	744	53.2
1887	621	62.8	1905	684	48.0
1888	785	77.8	1906	1063	73.3
1889	736	71.6	1907	890	60.3
1890	666	63.5	1908	533	35.5
1891	683	63.6	1909	331	21.7
1892	440	40.1	1910	272	17.5
1893	456	40.6	1911	230	14.5
1894	370	32.2	1912	205	12.76
1895	469	40.0	1913	257	15.75
1896	402	33.6	1914	124	7.48
1897	401	37.8			

FIRST ASSISTANT (TESTING LABORATORY), BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS, \$1,500 a year, October 24.

*Training and Experience—Weight 4.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). Give in some detail the precautions to be observed, with reasons therefor, in planning and making a series of tests for the purpose of investigation. 2. (*=10%*). Describe the processes used for the manufacture of Portland cement. Give the average chemical analysis of Portland cement. Of what value is the chemical analysis in determining the quality of a cement? 3. (*=10%*). What are the mineral constituents present in a Portland cement, as shown by the microscope? As determined by synthetic experiments, what is the chemical composition of these minerals? State Richardson's theory of set and of hardening. 4. (*=10%*). Discuss the effect upon the qualities of a cement of variations in grinding, mixing and burning. 5. (*=10%*). Briefly describe the method of production of pig iron, cast iron, wrought iron, bessemer steel, open hearth steel and crucible steel; also give the principal chemical characteristics and physical qualities which make them valuable for specific uses, naming these uses. 6. (*=15%*). Give the method of failure and description of fracture of the following: In tension, bronze, cast iron, wrought iron, rivet steel, structural steel and tool steel. In compression, cubical specimens,—concrete, granite and hard trap rock. In compres-

sion, specimens whose length equals twice the thickness—concrete, cast iron, wrought iron. 7. ( $=10\%$ ). Upon what qualities of the mortar and the coarse aggregate does the strength of the concrete depend? Give a detailed plan of a series of tests that will show this relation. 8. ( $=15\%$ ). (a) A cast iron I-beam on supports 8 feet apart carries a concentrated load of 100,000 lbs. at a distance of 9 inches from a support. The I-beam is 12" deep, of  $1\frac{1}{2}$ " metal throughout, top flange 3" wide and bottom flange 4" wide. Calculate the maximum fibre stress. (b) Determine the deflection of above beam under a uniform load of 200,000 pounds. 9. ( $=10\%$ ). Show the important details, using sketches of a machine for making tensile, compressive and transverse tests. State conditions a good testing machine should meet.

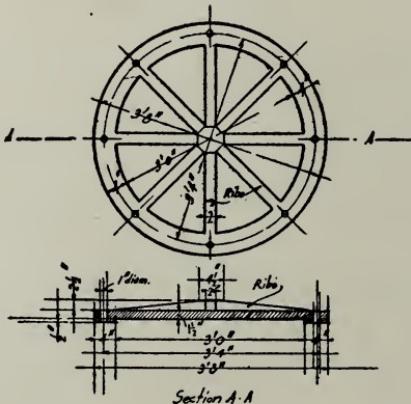
MECHANICAL DRAFTSMAN (SEWAGE DISPOSAL), BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS, \$1,000 a year, October 25.

*Training and Experience—Weight 3.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 7.* 1. (*Credit=10%*). The diameter of a  $\delta$  is 72'. Compute to the nearest  $1/100'$  the length of the side of a circumscribed hexagon. 2. ( $=13\%$ ). (a) Compute the weight of the casting as per sketch. C. I. weighs 450 lbs. per cubic foot. (b) This casting is to be placed on a pressure conduit manhole which operates under a head of  $38\frac{1}{2}$  ft. With tension in bolts at 8,000 lbs. per s.q. in., compute the size and number of bolts necessary. 3. ( $=10\%$ ). Show in India ink standard conventional signs for (a) wood; (b) steel casting; (c) cast iron; (d) brass; (e) copper; (f) Babbitt. Letter each neatly. 4. ( $=13\%$ ). The base of a triangle is 212.34 ft. long. The interior angles which the base makes with the other two sides are respectively  $36^\circ 18'$  and  $47^\circ 33'$ . Compute the other angle and the remaining sides. 5. ( $=10\%$ ). Compute the size of a circular steel shaft to transmit 96 H.P. when making 300 R. P. M. in the following formula:

$$\frac{396.000 \text{ HP}}{2 \pi n} = S - \frac{J}{c} - \frac{J}{c} = \frac{1}{16} \pi d^3 \text{ and } S = 12,000 \text{ lbs. per sq. in.}$$

6. ( $=18\%$ ). Compute the H.P. of motor required for pumping sewage under the following conditions: (a) Flow — 1,400 gals. per minute; (b) static head — 23 ft.; (c) force main — 12" diam.; (d) length of force main — 456 ft.; (e) loss of head due to friction in F. M. in ft. per 1,000' — 0.4 velocity squared; (f) motor efficiency — 90%; (g) pump efficiency — 56%. 7. ( $=17\%$ ). Name two kinds of sewage screens which are suitable for operating in a channel 5' 4" wide and 6' high, and in which the sewage flow is 4' deep. The clear spacing of the bars shall be  $2\frac{1}{2}$ ". Make pencil sketches of each to scale and show how each one is operated. Make sufficient computations to complete your sketches. 8. ( $=9\%$ ). (a) A "power" rail is to be used in a sewage plant for electric crane work. Show by sketch how this rail should be protected to prevent accidents to workmen. (b) define the following briefly and clearly: (a) efficiency; (b) H. P. (c) B. T. U.; (d) volt; (e) ohm; (f) ampere; (g) watt; (h) k. w.



*Sketch for Problem 2 "a" & "b." Scale 3/4":1".  
Note! For clearness, section lining on Ribs has been omitted  
Mechanical Draftsman. 1000.  
Oct 25, 1916.*

TRACER, ANY BUREAU, ANY DEPARTMENT, \$600 or less a year, October 26.

*Training and Experience—Weight 2.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 8.* 1. (*Credit=5%*). Describe the method of stretching drawing paper preparatory to using water

SCALE 1 INCH = 2000 FEET

Population 1915 is 150,000. Increase of population for the entire city 15% every 10 years. Sewers to be designed for population in 1945. No increase in tax places in 4 central districts.

Present total dry weather flow of sewage, 20.7 m<sup>3</sup>/s. including industrial wastes and infiltration at rate of 800 cu ft/s per sq. mi.

Seit Sonny clay, mit Rückjagd im gleichen

卷之三

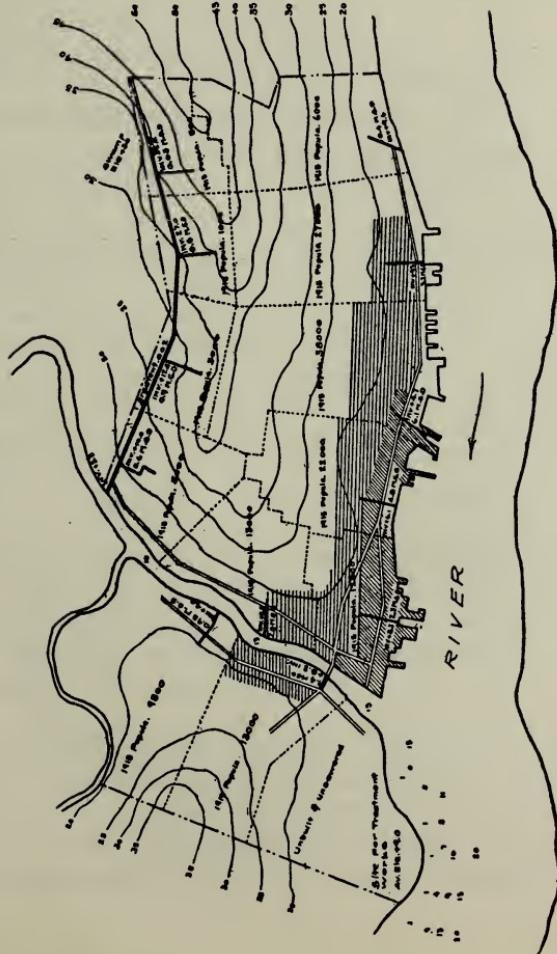
	Average flow of large river	2000 sec. ft.
Maximum	1,000	1
Minimum	1	1
Average	400	1
Median	140	1
Platinum	100	1

River is a tidal stream sufficiently distant from Ocean to be fresh. Town across river opposite lower boundary of City. Other towns 4 miles and 10 miles distant, not taking water supply from river.

Pelletum low water

Groundings referred to mean low water.

Institutional



- colors. 2. (=5%). How do the sides of tracing cloth differ? What are the advantages and disadvantages of using each side? 3. (=5%). How is tracing cloth treated before using? 4. (=5%). Explain how erasures should be made on tracing cloth. 5. (=5%). What precautions should be taken to keep a tracing clean? 6. (=5%). Describe in detail the method of setting type for a title and printing it on tracing cloth with a hand press. 7. (=10%). Add  $37' 6\frac{1}{4}''$ ,  $1' 9\frac{3}{8}''$ ,  $23' 4 \frac{15}{16}''$ , and express the result in feet and decimal. 8. (=10%). Compute the area of a circle in square feet whose circumference is 1 yd. 9. (=50%). Make a tracing of the accompanying print in your best workmanship. The lettering on the print is not to be *traced*, but is to be copied in the same style of freehand lettering.

ARCHITECTURAL DRAFTSMAN, DEPARTMENT OF CITY TRANSIT, \$900-\$1,200 a year, October 26 and 27.

*Training and Experience—Weight 25.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 75.* 1. (*Credit=2.5%*). Name the orders of architecture as given by Vignola. 2. (=2.5%). State the principal difference between the Greek and Roman orders. 3. (=2.5%). Make a diagram of a Roman order, naming the principal sub-divisions and relative proportions in relation to the diameter of the column at its base. 4. (=2.5%). Make a freehand sketch of the following mouldings: (a) torus; (b) ogee; (c) astragal; (d) scotia; (e) fillet. 5. (=4%). Define the following terms used in building construction: (a) rafter; (b) ridge; (c) hip; (d) valley; (e) mullion; (f) muntin; (g) parlin; (h) arris; (i) lintel; (j) gable; (k) corbel; (l) jambs. 6. (=3%). Illustrate by freehand sketch the following joints used in framing. Label each sketch: (a) mortice and tenon; (b) dovetail; (c) mitre; (d) halved; (e) tongue and groove; (f) rabbeted. 7. (=5%). To what uses are the following materials most suitable in building construction? (a) copper; (b) slate; (c) brick; (d) terra cotta; (e) tile; (f) granite; (g) marble; (h) concrete; (i) yellow pine; (j) wire glass. 8. (=4%). Make a freehand sketch showing the usual methods of framing a 3 x 12 inch joist into a 10 x 16 inch yellow pine girder, tops flush. 9. (=2%). Name five rolled steel shapes used in building construction. 10. (=2%). Give a rule for proportioning the rise and treads of stairways. 11.

(==5%). How many feet board measure are contained in a box measuring 4 feet by 6 feet by 3 feet, outside dimensions, the material being 2 inches thick? 12. (==5%). How many bricks are contained in a 13-inch wall, 10 feet long by 8 feet 6 inches high, containing a window opening of 3 feet 6 inches wide by 5 feet 6 inches high? Give size of bricks estimate is based on. 13. (==5%). How many feet board measure will be required to lay a floor 12 feet 6 inches by 20 feet 6 inches, using  $\frac{7}{8}$ -in. tongue and groove flooring 2 1/2 inch, showing face? 14. (==5%). Define the term "Architecture" in a brief description not exceeding 150 words. 15. (==35%). Make a finished drawing of a twin double-hung window set in a 13-inch wall; size of wall opening 7 feet wide by 7 feet high, with brick arch and limestone sill. Show a full elevation plan and section to  $\frac{3}{4}$ -inch scale, and details necessary to make mill work to 3-inch scale. Letter and title drawing in neat style. 16. (==15%). Render freehand, to a large scale, a Roman acanthus leaf, in color. Title in neat style.

CHAINMAN, ANY BUREAU, ANY DEPARTMENT, \$720 or less a year, October 27.

*Training and Experience—Weight 2.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 8.* 1. (*Credit*=5%). What equipment should a chainman carry? 2. (==15%). Describe the method of measuring a line on sloping ground. 3. (==10%). For accurate work, which is preferable, a chain or tape? Why? 4. (==10%). Name five sources of errors in chaining. 5. (==10%). (a) Describe a leveling rod. (b) How is it held on a stake? 6. (==10%). Show a form of notes suitable for a level corps. 7. (==10%). How should a tape be cared for and cleaned? 8. (==10%). A street rises 16.714 ft. in a distance of 477.53 ft. What is its per cent of grade? 9. (==10%). One angle of an isosceles triangle is  $95^{\circ} 16'$ . Compute the other angles. 10. (==10%). The sine of a certain angle is  $4/5$ . Compute the tangent of this angle.

DRAFTSMAN, BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS, \$1,000-\$1,200 a year, October 30 and 31.

*Training and Experience—Weight 2.5.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 7.5.* 1. (*Credit*=6%). State

all the information that a sectional city plan should furnish. 2. (=6%). Describe the most accurate method of plotting a survey. State why you think this method is the most accurate. 3. (=6%). (a) State the principal sources of errors in angular measurements. (b) What limit of error is allowable in city work? 4. (=6%). Make a neat sketch of a 3'-0" x 4'-6" egg-shaped brick sewer in a full concrete cradle. 5. (=6%). Explain in detail how assessment bills for sewers, water pipe and paving are made out. 6. (=12%). Four sides of a traverse, ABCDE, were measured as follows:

Course	Azimuth	Distance
AB	54° 35'	282.50
BC	101° 25'	199.25
CD	141° 42'	132.13
DE	241° 50'	443.19

Compute the length and azimuth of side EA. 7. (=18%). (a) Consider the courses of the above traverse as the center lines of streets whose widths are as follows:

Course	Street	Width
AB	Sixth	12'-26'-12'
BC	Smith Ave.	25'-70'-25'
CD	Locust	12'-36'-12'
DE	Seventh	12'-26'-12'
EA	Pine	12'-26'-12'

Compute the length of all the interior house lines of ABCDE accurately to one-hundredth of a foot. (b) Record the data and results of these computations on a separate sheet. 8. (=40%). Make a finished drawing, in India ink, to a scale of 1" = 40', of the plot described on the data sheet. All curved curbs have a 10' radius. Show the curb lines, lengths of house lines, and all other necessary information. Design an appropriate title and execute it in your best style.

RODMAN, ANY BUREAU, ANY DEPARTMENT, \$960 or less a year, November 1.

*Training and Experience—Weight 2.5.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 7.5.* 1. (*Credit=10%*). (a) Name two types of leveling rods. (b) Make a neat sketch of one

type and describe its construction. 2. ( $=10\%$ ). Define the following terms: (a) City datum; (b) bench mark; (c) turning point; (d) back sight; (e) height of instrument. 3. ( $=10\%$ ). Make out the notes, in proper form, for a set of levels, using four stations and two turning points. Show a check on your work. 4. ( $=10\%$ ). Describe the method of setting up a transit. 5. ( $=10\%$ ). If you found that the bubbles in the plate levels would not stay in the centers of the tubes during a full revolution, after leveling the transit, what should you do? 6. ( $=10\%$ ). Is it possible to do good work with a level that is out of adjustment? Give the reasons for your answer. 7. ( $=10\%$ ). What is the approximate change in length of a 100 ft. steel tape due to a change in temperature of  $75^{\circ}$  F.? 8. ( $=15\%$ ). A trapezoidal lot, having bases of 50 ft. and 90 ft. and an altitude of 120 ft., is to be divided in half by a line parallel to the bases. Compute the length and position of this line. 9. ( $=15\%$ ). Compute the numbers of cubic yards of excavation and fill required to grade a street 40 feet wide, 425 feet long, with side slopes of  $1\frac{1}{2}$  horizontal to 1 vertical, the cut at one end is 12.3 ft. and the fill at the other 5.7 ft. Consider all the sections as level.

SECOND ASSISTANT TO DISTRICT SURVEYOR, BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS, \$1,000 a year, November 2.

*Training and Experience—Weight 24.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 76.* 1. (*Credit* $=10\%$ ). Name the adjustments for the transit in their proper order and describe briefly the method for making the three most important adjustments. 2. ( $=10\%$ ). Name the three principal adjustments for the Wye-level, and describe briefly the adjustment by the "peg method." 3. ( $=5\%$ ). Name three essentials for making consistently accurate measurements with the steel tape. 4. ( $=20\%$ ). Grading estimate: (a) Assuming a uniform cut of 4 feet, how many cubic yards of excavation will be required to grade Somerton street, Fig. 1, between the south house line of Beechwood avenue and the north house line of Archer street? Paving estimate: (b) How many square yards of paving will be required to pave Somerton street, between the south curb line of Beechwood avenue and the north curb line of Archer street, assuming four curved curb corners to be placed; and how many square yards of

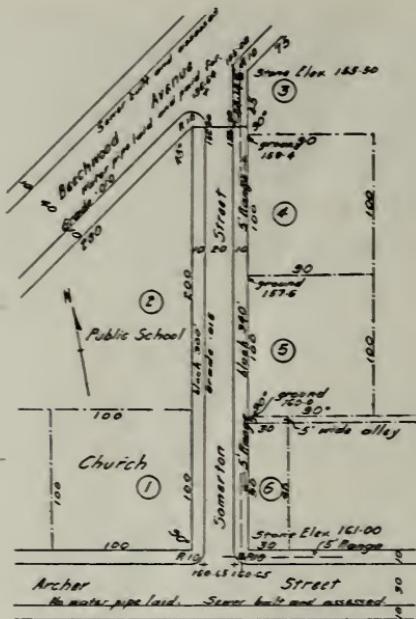


Fig. 1

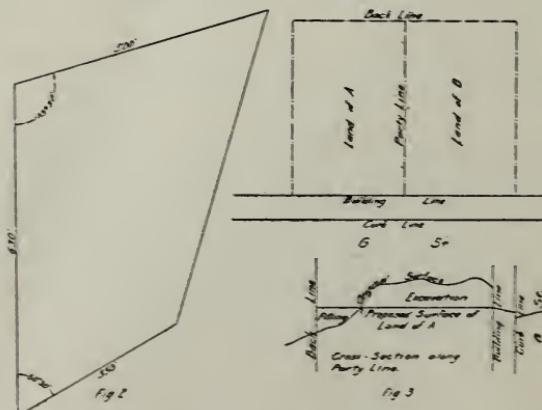


Fig. 3

paving will be assessable against property owners? Water pipe assessment: (c) Assuming water pipe laid in Somerton street October 1, 1916, from the middle of Archer street to the middle of Beechwood avenue; give the amounts of the assessment bills

for same against properties marked 1, 2, 3, 4, 5 and 6. Sewer assessment: (d) A sewer is built in Somerton street, from Beechwood avenue to the north house line of Archer street; give the amounts of assessment bills for same against the properties marked 1, 2, 3, 4, 5 and 6. 5. ( $=5\%$ ). Show a sketch of field notes for a staking survey for the two lots, 4 and 5, on the east side of Somerton street, with grade. 6. ( $=15\%$ ). Calculate remaining side and angles of Fig. 2 and give area in square feet. Log tables to be used. 7. ( $=5\%$ ). Describe method of setting stakes for lines and grades in tunnels from one shaft to another on straight line in rock. 8. ( $=10\%$ ). The hypotenuse of a right triangle is 17.66' and the base 8.83'. What fractional part is the area of this triangle of an equilateral triangle whose shortest distance from base to apex is equal to three times the perpendicular of this triangle? 9. ( $=10\%$ ). Referring to Fig. 3, A and B are owners of lots of ground which have not been graded, the surface along the party line being shown on the above cross-section. A wishes to grade his lot to the level of "G" street, and a retaining wall will be required. How should this wall be built with reference to the party line, both along the excavated and filled portions? Has B a right, under any circumstances, to allow the surface water falling on his land to run upon the land of A after A has completed the grading of his lot? If so, under what conditions? 10. ( $=10\%$ ). Explain how you would make survey plan for conveyance of property where there are encroachments on the property lines, and explain what you would do if there is an overlap in the deeds of this and adjoining property (not considering right of possession).

ASSISTANT ENGINEER IN FIELD (SEWAGE DISPOSAL), BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS, \$1,800 a year, November 3.

*Training and Experience—Weight 3.5.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 6.5.* 1. (*Credit=5%*). Preliminary surveys and contract drawings have been made for a large sewer with flat grades, several miles long and passing through several survey districts. You are put in charge of the construction and records of the preliminary lines and levels turned over to you. What surveying should you do prior to furnishing lines and grades for construction? 2. ( $=10\%$ ). A preliminary loca-

tion for a sewer has been determined from topography and office records. One part of the line lies in a built-up street containing underground structures; the other part lies in open, undeveloped country. What information would you obtain for the preparation of contract drawings? 3. A sewer is to be built in tunnel for a distance of one mile. At midlength tangents are connected by a curve of 200 ft. radius with central angle of  $90^\circ$ . Open cut portals at each end of the tunnel and 4 shafts along the lines spaced at equal distances. Work is to be begun simultaneously at the portals and shafts and carried forward in both directions. (a) ( $=2\%$ ). State how you would carry the line down the shafts. (b) ( $=2\%$ ). State how you would carry the levels down the shafts. (c) ( $=2\%$ ). State how you would carry the line forward into the headings. (d) ( $=2\%$ ). Assuming the excavation of the tunnel to be completed before any sewer is constructed, what procedure would you follow before giving line and grade for construction of the sewer? 4. A shaft for a 10-ft. sewer is to be sunk to a depth of 100 ft., the upper 25 ft. through loose earth, the next 50 ft. through seamy rotten rock, the lower 25 ft. in hard solid rock. (a) ( $=2\%$ ). What dimensions would you lay out the shaft at the surface? (b) ( $=5\%$ ). How would you timber the shaft? (c) ( $=5\%$ ). What rate of progress should a good contractor make through each of the three classes of excavation? 5. ( $=10\%$ ). A contract is made for the construction of a sewer with concrete cradle, vitrified brick invert, and brick arch; excavation partly in rock and earth; finished work to be paid for at a price per foot of sewer which is to include all appurtenances. What information would you furnish for preparation of current estimates? 6. ( $=10\%$ ). Write a report to the Chief Engineer on a complaint of damage to private property alleged to have been caused by blasting during the construction of a sewer in your charge. Sign this report "*John Doe.*" 7. ( $=10\%$ ). (a) Make a freehand sketch of the cross section you would excavate and the method of timbering a tunnel in earth excavation for a sewer to consist of precast concrete pipes 5 ft. 6 in. internal diameter and 6 1/2 in. thick. (b) ( $=10\%$ ). Make a freehand sketch of the method you would use in timbering a tunnel in seamy rock for an 8 ft. 6 in. circular sewer with concrete invert and brick arch. 8. ( $=5\%$ ). A sewer is built through private property along the line of an unopened street. To whom does the excavated material belong? What width right-

of-way would be allowed the contractor for carrying on his work? 9. ( $=10\%$ ). What different mixtures of concrete are used in sewer construction? Where is each generally used? What kinds of aggregates are allowed to be used by the Bureau of Surveys? 10. ( $=10\%$ ). How would you secure a proper foundation for a sewer in soft, yielding soil?

ASSISTANT SANITARY ENGINEER, BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS, \$1,500 a year, November 8.

*Training and Experience—Weight 3.* See examination for Laboratory Assistant (Physical), held January 4.

*Practical Questions—Weight 7.* 1. Assume a town of 100,000 population; water supply at 100 gallons capacity a day; 100 miles combined sewers; industrial wastes negligible; population and mileage of sewers expected to increase 60% by 1950. A sewage treatment plant to consist of coarse screens, grit chambers, Emscher tanks, sludge drying beds, dosing tank, and percolating filters is to be constructed now with provisions where necessary for extensions to meet demands of 1950. (*Credit=10%*). (a) For your design what rates of flow would you use for present and 1950 conditions as follows: Average dry weather flow; maximum dry weather flow; storm weather flow. Make your own assumptions of conditions, but state briefly reasons for adoption of each. (b) ( $=5\%$ ). What size openings would you use for the screens and at what angle with horizontal would you place them? (c) ( $=10\%$ ). Make freehand sketch showing plan, longitudinal and transverse cross sections of the necessary grit chamber for 1950 conditions. Only give general dimensions. Do not design the transverse cross section but sketch a form which generally gives ideal velocities. (d) ( $=20\%$ ). Give the general dimensions in plan and cross section of a unit Emscher tank for these works and state the number of units needed in 1950. In arriving at these dimensions state the time of retention you advise for the sedimentation chamber, the time of retention you advise for the sludge, and the per capita quantity of sludge you use. (e) ( $=5\%$ ). What rate do you advise for the percolating filter. What acreage for the 1950 conditions? What depth and size media? What kind of underdrainage floor? (f) ( $=5\%$ ). How many square feet of sludge bed do you advise for 1950 conditions and what depth and kind of media? 2. ( $=5\%$ ). The following analyses of sewage and effluent from a works, consisting of

Emscher tank, percolating filter, and final settling basin, are submitted to you:

SOURCE	Susp. Solids	Nitrogen as			Rel. Stab.	% Sat. D. O.
		Organ.	Free NH <sub>3</sub>	Nitrates		
Crude effluent	250	10	8	1.00	—	12
Tank effluent	80	8	16	0.00	—	0
Filter effluent	20	6	10	0.10	40	2
Final effluent	40	5	12	0.00	20	0

What is probably the matter with the tank, the filter and the settling basin? 3. (=5%). The following analyses of sludge drawn from two Emscher tanks is submitted to you:

	Wet Sludge		% of Dry Residue that is		
	Sp. Gr.	% H <sub>2</sub> O	Fixed	Volatile	Fat
Tank A	1.17	78	64	36	6
Tank B	1.02	90	48	52	10

Which tank is working right and why do you think so? 4. (=10%). Describe briefly the essential features of the Emscher tank and state results which should be accomplished. 5. (=10%). Describe briefly the essential features of the activated sludge process and state results which should be accomplished. 6. (=5%). What are the principal uses of grit chambers? What do you consider the proper velocity of flow? Why? 7. (=5%). A 5-ft. circular sewer is laid on a grade of 0.37 ft. per 100 ft. What is its carrying capacity in million gallons a day when running full, as determined by Chezy formula with a value of C = 120? 8. (=5%). In preparing design for a 5-ft. circular sewer, what invert material would you use for the following velocities: (a) 2.5 ft. per sec.; (b) 7.5 ft. per sec.; (c) 15.8 ft. per sec.?

ASSISTANT ENGINEER (GRADE CROSSING DIVISION), BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS (Promotion), \$1,400 a year, December 26.

*Training and Experience—Weight 4.* See examination for Laboratory Assistant (Physical), held January 4. NOTE:—No logarithm book or book of tables necessary.

*Practical Questions—Weight 6.* 1. (*Credit=12%*). Figure 1. NOTE:—All figures are District Standard. 100.00 feet Dis-

trict Standard = 100.25 feet U. S. Standard. Quantities to be in U. S. Standard. "B" street is to be paved and curbed as indicated on the above sketch. Calculate the quantities of the different surface materials to complete the work, including the total feet of curb, straight and curved. What length would you recommend for the pieces of curb, both straight and curved? 2. ( $=9\%$ ). As shown in sketch of question # 1, "B" street is to be paved with a granite block five (5) inches deep on a concrete

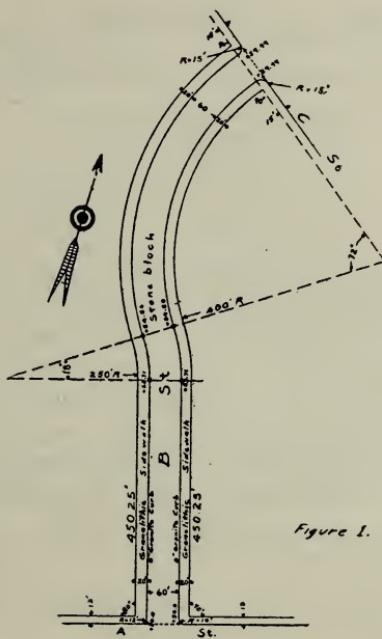


Figure 1.

base, the curb and the granolithic paving are to be Grade Crossing Standards. Draw a neat cross section at 600 feet north of the curb line of "A" street, showing the depths of the different materials of construction; also the elevations of the house lines, gutters, top of curbs and the crown. 3. ( $=15\%$ ). Figure 3. Write in detail how you would set the stakes for the construction of the sewer as shown in the sketch above, assuming the street graded to the finished surface and your stakes driven flush with this surface. Make a schedule showing the cuts from top of stakes to invert of new sewer. There are to be six (6) manholes located between house lines of intersecting streets. Show stations

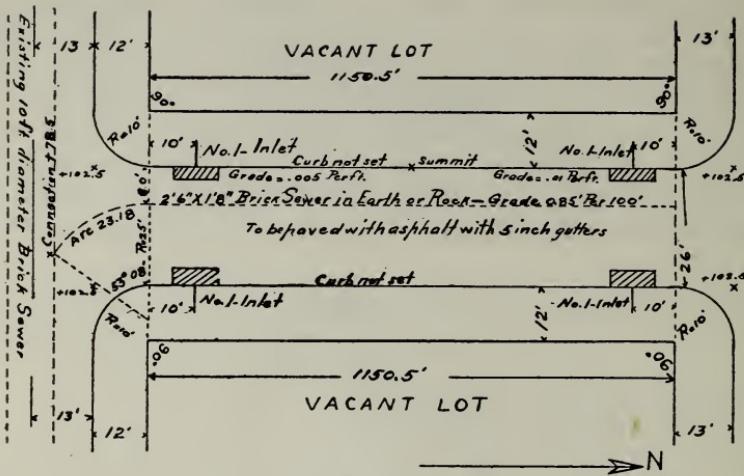


Fig. 3

in schedule of each house and inlet slant, also of manholes, so that one will not interfere with the other; also give distances from the invert of sewer to the top of the manhole frame so that they may be set to the correct surface of the new pavement. 4. (=10%). Figure 4. A twelve (12) inch water pipe is to be laid as shown in above sketch. Assume that the street and intersections are to be paved with vitrified block; that the street has been correctly graded to the finished surface; that the gutters are to be six

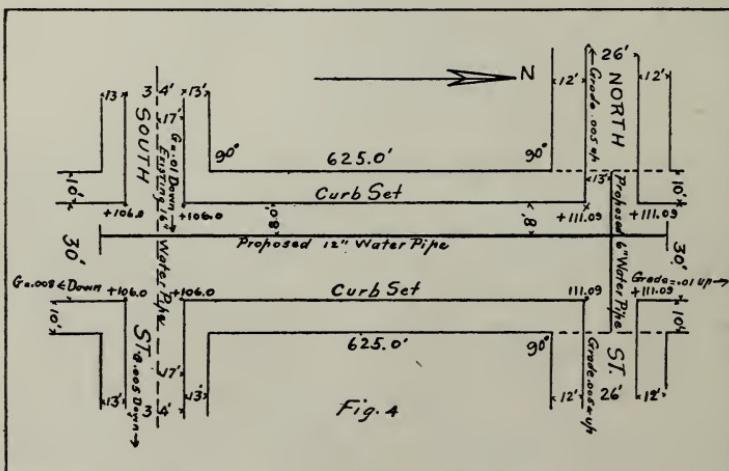


Fig. 4

inches deep. Figure the cu. yds. of excavation that will be necessary to lay the proposed six (6) and twelve (12) inch lines, the quantities of materials and the location and elevation of the top of the frame for the step valves. 5. ( $=8\%$ ). Figure 5. Show elevation and location of stakes to pave the intersection in the attached sketch with granite blocks as indicated by dotted lines.

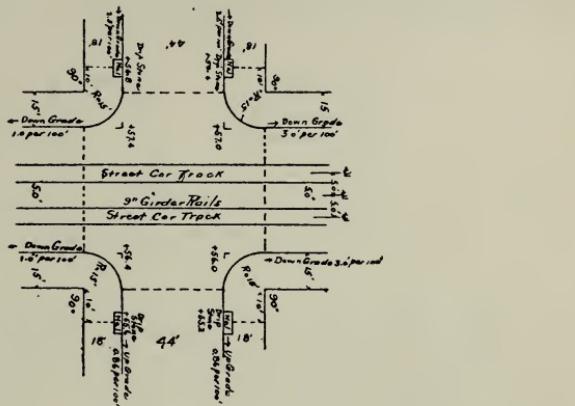


Figure 5

6. ( $=10\%$ ). Figure 6. The top of the first floor of each pair of houses is at a minimum distance of 3 ft. above the present curb and the cellar floors are 5 ft. below the curb. The cellar walls are 18 inches thick. Make a supplemental plan showing how the walls of these houses are to be underpinned, figuring the quantity

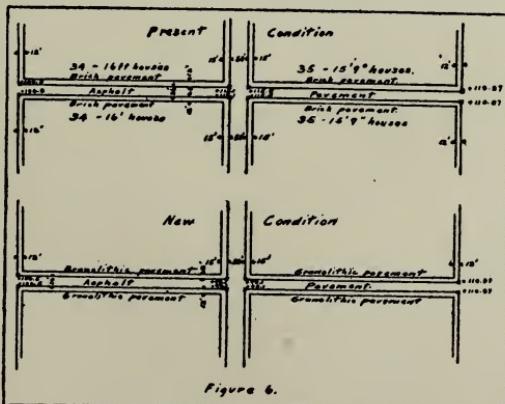


Figure 6.

of stone masonry necessary from the surface of the present brick pavement which has a grade of  $\frac{1}{2}$ " per foot. 7. ( $=10\%$ ). Figure 7. Calculate the amount of concrete in cu. yds. contained in this footing and make a table for feet and tenths of a foot for the variable slab so that the cu. yds. may be obtainable from the table for the varying depths up to 10 ft. The logarithm of 5 is 0.6989700. What is the logarithm of the  $\sqrt{625}$ ? 8. ( $=8\%$ ). Make a tabulated estimate of the quantities of materials necessary

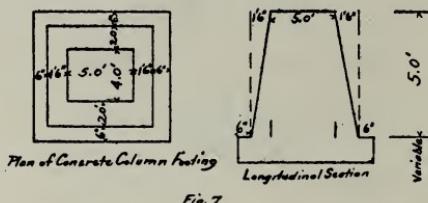


Fig. 7

to lay 1 mile 90 lbs. of tee rail track on a sub-grade that is always wet. Also for 1 mile of 9" girder rail 159 lbs. to be laid in a street to be paved with granite block. 9. ( $=8\%$ ). If sent out to make a survey of the present conditions on streets where the grade is to be lowered an average of 10 ft., state in detail the data that you would record so that the plans may be made and the quantities may be obtained for an estimate of the cost of the work. 10. ( $=10\%$ ). If sent to make a survey of the present interlocking telegraph and telephone track and signal system of a railroad, state in detail the data you would collect in order to make a present condition plan with summary of materials.





# FIRE SERVICE

FIREMAN (Promotion), BUREAU OF FIRE, DEPARTMENT OF  
PUBLIC SAFETY, \$1,100 a year, June 8.

*Training and Experience—Weight 5.* 1. What is your age? ....years....months. 2. Did you attend Common School? (Yes or no.) Did you attend Grammar School? (Yes or no.) 3. Give the following information for the last day school you attended: Name of school; location of school (city or town); date entering; date leaving; grade reached. 4. Have you ever attended night school? (Yes or no.) If you answer yes, give details asked in Question 3. 5. When did you enter the Fire Department? Year of..... Have you ever been out of the Fire Department since you entered? (Yes or no.) If you answer yes, fill in the following: When were you out of the service? How long were you out?....years....months. What was the date?....year....month....day. What did you do during the time you were out of the service? 6. Have you ever been suspended or demoted? (Yes or no.) If you answer yes, fill in the following: When were you suspended or demoted? ....year....month....day. Was it a suspension? (Yes or no.) Was it a demotion? (Yes or no.) Why were you subjected to this penalty? 7. Give in order the positions you have held in the Fire Bureau, with the dates, length of service and district served in. 8. Give a list of the important fires at which you acted as fireman for the Department.

9. Have you ever been employed as a stationary engineer? (Yes or no.) Portable engineer? (Yes or no.) Marine engineer? (Yes or no.) Stationary or marine fireman? (Yes or no.) Oiler? (Yes or no.) Machinist? (Yes or no.) Boilermaker? (Yes or no.) If you answer yes for any of these positions listed above, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 10. Have you ever served in any other organization of military or fire character? (Yes or no.) If you answer yes, give names of organizations and lengths of service, with dates.

*Practical Test—5.* This will consist of a practical test in operating an engine, and also a shop test.

STEAM ENGINEER (Promotion), BUREAU OF FIRE, DEPARTMENT OF PUBLIC SAFETY, \$1,200 a year, June 8.

*Training and Experience—Weight 5.* For Questions 1, 2, 3, 4, 5, 6, 7 and 8, see examination for Fireman (Promotion), held June 8.

9. Give a list of the important fires at which you acted as engineman for the Department, with the year, location of fire, number of alarms and hours of service.

For Questions 10 and 11, see Questions 9 and 10, examination for Fireman (Promotion), held June 8.

*Practical Test—Weight 5.* This will consist of a practical test in operating an engine, and also a shop test.

TILLERMAN (Promotion), BUREAU OF FIRE, DEPARTMENT OF PUBLIC SAFETY, \$1,200 a year, June 12.

*Training and Experience—Weight 5.* 1. Give the names and addresses of two reputable citizens who will vouch for the truth of your answers on this paper. 2. What is your age? 3. What schools (names and places) did you attend? If you did not finish Grammar School, what was the highest reader you studied? How far did you go in Arithmetic (fractions, decimals, practical measurements, percentage or interest)? If you attended High School or any other school after leaving Grammar School, state where and how long, and what course you pursued. 4. When did you enter the Fire Department? Have you been out of the Fire Department any time since you entered? If so, why? What did you do during that time? Have you ever been suspended or demoted? When, why and how long? 5. Give in order the posi-

tions you have held, with dates and length of service in each and the districts served in, since you entered the Fire Department. Have you ever served in any other organization of military or fire character? When, where and how long? When were you discharged? 6. Give in order any positions you have held before entering the Fire Department, with the names and addresses of your employers, character of business, length and dates of your employment, duties of your position, salary received in each case. 7. If you have been in business for yourself, state the nature of the business, how long, and the average yearly income. 8. Give the names and addresses of three citizens whom you are willing to have consulted as references.

*Practical Test—Weight 5.* This will consist of a practical test in the operation of a tiller.

DRIVER (MOTOR), (Promotion), BUREAU OF FIRE, DEPARTMENT OF PUBLIC SAFETY, \$1,100 a year, June 14.

*Training and Experience—Weight 5.* See examination for Tillerman (Promotion), held June 12.

*Practical Test—Weight 5.* This will consist of a practical test in the operation of a motor.

HOSEMAN, BUREAU OF FIRE, DEPARTMENT OF PUBLIC SAFETY, \$900-\$1,100 a year, June 19.

*Training and Experience—Weight 1.5.* 1. What is your age? .... years.... months. 2. Did you attend Elementary School? (Yes or no.) How far did you go in Elementary School? Did you attend Grammar School? (Yes or no.) How far did you go in Grammar School? Where did you attend school? 3. Have you a trade? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 4. If you have no trade, what is your occupation? Give details asked in third question. 5. Have you ever served in a Fire Department or Company? (Yes or no.) If you answer yes, give name of company, location, length of time served, with dates. 6. Have you ever served in the United States Army or Navy? (Yes or no.) If you answer yes, give details asked in fifth question. 7. Have you ever acted in any other military or naval organization? (Yes or no.) If you answer yes, give details asked in fifth question. 8. Give below a detailed statement of any other work

you have done, not mentioned above, which would fit you for the position of hoseman.

*Arithmetic—Weight .5.* Note:—No credit will be given for partially correct answers. 1. (*Credit=20%*). Add 94,659, 59,465, 37,976, 28,543. 2. (*=20%*). Subtract 92,453 — 24,395. 3. (*=15%*). Multiply  $35,642 \times 6$ . 4. (*=15%*). Multiply  $2,468 \times 54$ . 5. (*=15%*). Divide  $8 \div 3,456$ . 6. (*=15%*). Divide  $17 \div 4,165$ .

*Penmanship—Weight .5.* Penmanship will be marked on the following exercise, which is to be copied in your best handwriting:

Marine Hall, an addition to the City Aquarium in Fairmount Park, on the site of the old water works, will be opened for the first time to the public this morning. To make it possible to house the numerous varieties of fish which stock the Aquarium, 100,000 gallons of salt water were brought on three barges from Cape May and pumped into the tanks.

*Memory Exercise—Weight 1.5.* (1) Captain Henry Hunter, (2) of Engine Company No. 50, (3) ordered Hoseman Parker, (4) of this company, (5) to go to Engine Company No. 9, (6) by Germantown avenue trolley, (7) and bring back, (8) an axe, (9) a rope (10) and a valve.

*Physical Test—Weight 6.*

## **POLICE SERVICE**

ASSISTANT FIRE MARSHAL, BUREAU OF POLICE, DEPARTMENT OF PUBLIC SAFETY, \$1,600 a year, March 23.

*Experience—Weight 3.* 1. What is your age? 2. Give the names and locations of the schools (Grammar, High, College or Technical) which you attended, the courses you took in each and the date of your graduation. If you did not graduate, how far did you go? 3. Have you ever served in any organization of military or police character? (Yes or no.) When? Where? How long? If not still with said organization, state cause of separation. 4. Give, in order of time, any positions you have held, names and addresses of employers, character of business, dates and length of employments, duties of your position, and salary received in each case. 5. Give the names and addresses of your employers whom you would be willing to have consulted as references. If you have not worked for any one, give the names and addresses of three persons who will vouch for your executive ability. 6. If you have been in business for yourself, state the nature of business, how long, and average yearly income.

*Practical Questions—Weight 4.* 1. (*Credit=12%*). Mention five of the most frequent causes of fires in each of the following classes of buildings, but do not repeat the same cause in any two: (a) Churches; (b) shirtwaist factories; (c) department stores; (d) warehouses. 2. (*=12%*). Describe in detail the method of making investigations as to the origin of a fire. 3. (*=12%*). How can a fire caused by spontaneous combustion be distinguished from one of incendiary origin? 4. (*=12%*). What investigation would be necessary in the case of a fire which tended to indicate that the building was set on fire in order to obtain money to settle financial embarrassment? 5. (*=16%*). In an investigation of a fire the following facts were disclosed: Quantities of excelsior which were saturated with kerosene were found scattered over the floors and stairs of a building, together with the ends of partly burned candles. What investigations, if any, are necessary and what evidence should you endeavor to produce? 6. (*=12%*). An investigation of an apartment house disclosed a wooden partition in a section of the cellar used as a storeroom placed adjacent to the furnace, the ashes of the furnace being placed close to the wooden partition. What action would you

take? 7. (=12%). What is meant by slow-burning building construction? 8. (=12%). What are the standard forms of fire-resisting shutters?

*Laws and Ordinances—Weight 2.* 1. (*Credit=15%*). What procedure is taken upon discovery of unlawful methods of storing explosives or combustible materials? 2. (=13%). What is required by law relative to moving picture booths? 3. (=13%). In what sections of Philadelphia may petroleum oils be manufactured and stored in large quantities? 4. (=15%). Are proprietors of moving picture places permitted to place a column of folding chairs in a wide aisle? Give the reasons for your answer? 5. (=14%). (a) What materials are included under the term "high explosives"? (b) Give the maximum amount of any three high explosives that may be stored in one building. 6. (=15%). What fire-fighting equipment is required by law in theatres? 7. (=15%). State the regulations covering stage scenery, curtains and decorations in theatres.

*Report Writing—Weight 1.* Write a report to the Fire Marshal on assumed investigation of a stable which was converted into a garage. Sign this report "*John Doe.*" The following elements will be considered in grading this report: form, grammar, ideas.

LIEUTENANT (Promotion), BUREAU OF POLICE, DEPARTMENT OF PUBLIC SAFETY, \$1,800 a year, March 31.

*Training and Experience—Weight 4.* 1. Where were you born? 2. What is your age? 3. Name the schools you attended, and state the time spent in each. 4. What did you do before you entered the Police Department? State in full the duties of your positions, for whom you worked, how long in each position, and your salary in each. 5. When did you enter the Police Department? Have you ever been out of the service since then? If so, why and how long? Give dates. 6. State in full the positions you have held in the Police Department and the length of time at each station house, putting these facts in four columns:

<i>Position</i>	<i>Station House</i>	<i>From (Date)</i>	<i>To (Date)</i>
-----------------	----------------------	--------------------	------------------

7. Has your work in the Police Department ever been publicly commended? If so, give full details. 8. In your opinion, what do you consider the best work you have done in the Department? 9. Have you ever been "called to the front"? If so, give dates and full details in each case. 10. Have you ever served in a

military or naval organization, State or Federal? NOTE:—All answers to these questions are subject to verification by the Commission.

*Practical Questions—Weight 4.* 1. (*Credit=15%*). Write a description of the three platoon system as it is now in use in the Bureau of Police, City of Philadelphia, and state how its use affects the efficiency of police service. 2. (*=10%*). How would you proceed to make a good police officer out of a newly appointed sub-patrolman? 3. (*=8%*). Mention all the regular written reports a lieutenant is required to make if in charge of: (a) a district; (b) the harbor service; (c) the traffic corps, including motorcycle squad; (d) mounted traffic squad and reserves. 4. (*=10%*). Mention some of the important matters that should receive the early attention of a lieutenant who has been transferred to a new district. 5. (*=10%*). What action should you take in case the following are reported in your district (a) murder; (b) robbery; (c) fire; (d) kidnapping; (e) a serious railroad wreck? 6. (*=10%*). Which of the following are misdemeanors and which are felonies: (a) abandoning children; (b) setting fire to a residence with intention to defraud the insurance company; (c) kidnapping; (d) burglary; (e) bigamy; (f) bribery; (g) libel; (h) forgery of checks; (i) counterfeiting; (j) perjury? 7. (*=10%*). Two automobiles collide at a street corner. One of the occupants is killed outright and several of the others are seriously injured. This occurred in the presence of a patrolman and he is convinced that it was due to recklessness on the part of the drivers. If the patrolman performs his duty perfectly, what should he do? Make a list of everything he should do under the conditions, until the matter is out of his hands. What action might this case require on the part of the lieutenant? 8. (*=10%*). A burglary was committed and some time afterwards a person was arrested for the crime, and on his person were found weapons, some personal effects, part of the stolen goods, and also pawn tickets representing some of the stolen goods. What action should be taken by the police officials in this case and what disposition should be made of the property found on his person? 9. (*=9%*). According to the regulations of the Bureau of Police, is a police officer ever justified in killing a person? Answer fully. 10. (*=8%*). A boy of twelve years of age has been arrested. What regulations must be observed, and give the procedure until the case is disposed of.

*Personal Fitness (Oral)*—Weight 2. This subject will be graded in an oral interview.

PATROLMAN, BUREAU OF POLICE, DEPARTMENT OF PUBLIC SAFETY, \$2.25-\$3.00 a day, April 10 to 12.

*Training and Experience*—Weight 1.5. 1. Give the names and addresses of two reputable citizens who will vouch for the truth of your answers on this paper. 2. What is your age? 3. Did you attend Grammar School? (Yes or no.) If you answer yes, fill in the following: name of school; location of school; date of entering; date of leaving. If you did not finish Grammar School, what was the highest reader you studied? How far did you go in Arithmetic (fractions, decimals, practical measurements, percentage or interest)? Did you attend High School or any other school after leaving Grammar School? (Yes or no.) If you answer yes, fill in the following: name of school; location of school; date of entering; date of leaving; course pursued. 4. Have you learned a trade? (Yes or no.) If so, what trade? How long have you worked at it?....years....months. 5. If you have no trade, what is your regular occupation? How long have you worked at it?....years....months. 6. Give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 7. Have you ever served in any organization of military or police character? (Yes or no.) If you answer yes, tell when, where, how long and why you were discharged. 8. Have you ever been in business for yourself? (Yes or no.) If you answer yes, give nature of business, length of time, and average yearly income. 9. Give the names and addresses of three of your employers or citizens whom you are willing to have consulted as references. 10. Do you use liquor? (Yes or no.) To what extent? 11. Have you ever been arrested? (Yes or no.) Give facts in each case, if any, and whether convicted, and sentence, if any.

Set of papers for section examined on April 10.

*Practical Questions*—Weight 1. 1. (*Credit=10%*). What reports and records must be made by a patrolman who has been forced to leave his beat in the performance of his duty? 2. (*=10%*). Give the titles of the officers of the uniformed force in the order of their rank from patrolmen up. 3. (*=10%*). Tell how a beat should be patrolled in the daytime. 4. (*=10%*). Who is the Captain of Detectives? 5. *=10%*. Give the posi-

tion of an officer when at "attention." 6. ( $=10\%$ ). Why must pocket guides of the City be carried by patrolmen? 7. ( $=10\%$ ). What procedure should be followed by an officer who is disabled or taken sick while on duty? 8. ( $=10\%$ ). What should an officer do in case a person is injured or taken seriously ill on the street? 9. ( $=10\%$ ). State what persons are to be admitted within fire lines. 10. ( $=10\%$ ). What should a patrolman do with a lost child found on his beat?

*City Information—Weight 1.5.* 1. (*Credit=10%*). Locate League Island Navy Yard. 2. ( $=10\%$ ). Locate the North Philadelphia Station Pennsylvania Railroad. 3. ( $=10\%$ ). Locate the Pennsylvania Building. 4. ( $=10\%$ ). Locate the Lafayette Building. 5. ( $=10\%$ ). Locate the United States Custom House. 6. ( $=10\%$ ). Locate the Jefferson Hospital. 7. ( $=10\%$ ). Locate the University of Pennsylvania. 8. ( $=10\%$ ). Locate Franklin Square. 9. ( $=10\%$ ). Locate the Central High School for Boys. 10. ( $=10\%$ ). In what section of the City is Tacony?

*Arithmetic—Weight .5.* NOTE:—No credit will be given for partly correct answers in this arithmetic. They will be marked either right or wrong. 1. (*Credit=20%*). Add: 2,965, 4,963, 476, 8,214. 2. ( $=20\%$ ). Subtract 84,249 from 91,632. 3. ( $=15\%$ ). Multiply 475 by 6. 4. ( $=15\%$ ). Multiply 5,924 by 68. 5. ( $=15\%$ ). Divide 1,855 by 7. 6. ( $=15\%$ ). Divide 5,994 by 37.

*Penmanship—Weight .5.* This subject will be marked on the written work of the entire examination.

*Physical Test—Weight 5.* In order to be placed on the eligible list, applicants will be required to obtain an average of at least 60% on the mental test.

Set of papers for section examined April 12.

*City Information—Weight 1.5.* 1. (*Credit=10%*). Locate Cramps' Ship Yard. 2. ( $=10\%$ ). Locate the Reading Terminal Station. 3. ( $=10\%$ ). Locate the Morris Building. 4. ( $=10\%$ ). Locate the Central Station Post Office. 5. ( $=10\%$ ). Locate the Philadelphia Hospital for Contagious Diseases. 6. ( $=10\%$ ). Locate the Philadelphia Commercial Museum Building. 7. ( $=10\%$ ). Locate Washington Square. 8. ( $=10\%$ ). Locate the West Philadelphia High School for Boys. 9. ( $=10\%$ ). Locate Moyamensing Prison. 10. ( $=10\%$ ). In what section of the City is Overbrook?

*Practical Questions—Weight 1.* 1. (*Credit=10%*). What should a patrolman do if he found someone sending in a false alarm of fire? 2. (*=10%*). If a patrolman noticed a fire on his beat several squares from a fire alarm box, what should he do? 3. (*=10%*). In case of a sudden death by accident on the highway, what facts is a patrolman required to enter in his note book? 4. (*=10%*). Name the six articles of equipment furnished to patrolmen by the Bureau of Police. 5. (*=10%*). Give the signals employed by patrolmen in summoning help. 6. (*=10%*). Are detectives and officers in plain clothes to salute or be saluted? Why? 7. (*=10%*). What should a patrolman do if a citizen should ask him for his name or number? 8. (*=10%*). What is the rule of the Department in regard to officers engaging in any other business? 9. (*=10%*). Who is the Superintendent of Police? 10. (*=10%*). Name two acts which are classified in the Patrolman's Manual as "Conduct unbecoming an Officer."

*Arithmetic—Weight .5.* NOTE:—No credit will be given for partly correct answers in this arithmetic. They will be marked either right or wrong. 1. (*Credit=20%*). Add: 7,654, 6,892, 176, 3,924. 2. (*=20%*). Subtract 65,984 from 91,649. 3. (*=15%*). Multiply 3,756 by 7. 4. (*=15%*). Multiply 376 by 47. 5. (*=15%*). Divide 1,256 by 8. 6. (*=15%*). Divide 7,267 by 43.

*Penmanship—Weight .5.* This subject will be marked on the written work of the entire examination.

*Physical Test—Weight 5.* In order to be placed on the eligible list, applicants will be required to obtain an average of at least 60% on the mental test.

Set of papers for section examined on April 15.

*Practical Questions—Weight 1.* 1. (*Credit=10%*). Name the articles included in the term "Patrolman's Uniform." 2. (*=10%*). Mention the particular matters that should receive the attention of patrolmen while on night duty. 3. (*=10%*). Name two acts which are classified in the Patrolman's Manual as "Disloyalty to the Service." 4. (*=10%*). Who is the Director of Public Safety? 5. (*=10%*). Tell how an officer should salute. 6. (*=10%*). Mention three items of police information that must be entered in a patrolman's loose leaf note book. 7. (*=10%*). Give the "Directions for operating Signal Boxes." 8. (*=10%*). Give the directions which must be followed in send-

an alarm of fire from a fire alarm box. 9. ( $=10\%$ ). Under whose medical supervision is an officer who is absent on sick leave? 10. ( $=10\%$ ). Name the six articles of equipment that must be furnished by the patrolman.

*City Information—Weight 1.5.* 1. (*Credit=10%*). Locate Baldwin's Locomotive Works. 2. ( $=10\%$ ). Locate the Midvale Steel Works. 3. ( $=10\%$ ). Locate the New Stock Exchange Building. 4. ( $=10\%$ ). Locate Baltimore & Ohio R. R. Station. 5. ( $=10\%$ ). Locate the Philadelphia General Hospital. 6. ( $=10\%$ ). Locate the House of Correction. 7. ( $=10\%$ ). Locate Stetson's Hat Manufacturing Plant. 8. ( $=10\%$ ). Locate Penn Treaty Park. 9. ( $=10\%$ ). Locate the Northeast Manual Training High School. 10. ( $=10\%$ ). In what section of the City is Manayunk?

*Arithmetic—Weight .5.* NOTE:—No credit will be given for partly correct answers in this arithmetic. They will be marked either right or wrong. 1. (*Credit=20%*). Add: 6,254, 6,897, 259, 4,756. 2. ( $=20\%$ ). Subtract 95,684 from 128,216. 3. ( $=15\%$ ). Multiply 854 by 8. 4. ( $=15\%$ ). Multiply 6,254 by 64. 5. ( $=15\%$ ). Divide 1,476 by 6. 6. ( $=15\%$ ). Divide 4,004 by 26.

*Penmanship—Weight .5.* This subject will be marked on the written work of the entire examination.

*Physical Test—Weight 5.* In order to be placed on the eligible list, applicants will be required to obtain an average of at least 60% on the Mental test.

CAPTAIN OF DETECTIVES, BUREAU OF POLICE, DEPARTMENT OF PUBLIC SAFETY, \$2,500 a year, April 28.

*Training and Experience—Weight 5.* 1. What is your age? 2. Where and during what years did you receive your education? Give dates, course of study and names of schools. 3. How long have you been connected with the Police Bureau? Give the exact dates, and show whether your service is continuous or not. 4. State the grades or positions you have filled in the service and how long in each. 5. Have you ever had any experience specifically in detective work? For how long a period and where? 6. Have you ever had direct charge of any number of detectives? If so, where, for what length of time, and of how many men? 7. What was your occupation before you entered the Bureau of Police?

*Practical Questions—Weight 5.* 1. (*Credit=5%*). Explain what extradition is. 2. (=6%). Under what circumstances must a warrant be sworn out before an arrest can be made? 3. (=6%). Under what circumstances is a detective justified in breaking the doors of a dwelling house? 4. (=5%). Under what circumstances is a detective justified in using a revolver? 5. (=6%). Define the following crimes: (a) assault and battery with attempt to kill; (b) manslaughter; (c) homicide in first and second degree. 6. (=6%). (a) How would you proceed if you received a telegram from the New York Police Department asking for the arrest of a person charged with murder? (b) Also, the same kind of a dispatch from the Chief of Police of Harrisburg? 7. (=6%). How would you cause the arrest of a fugitive in a foreign country? 8. (=6%). What method would you use if word of a murder in a hotel reached you and there was no clue? 9. (=6%). How would you keep track of and report on the movements, haunts, and habits of well-known bad characters and well-known criminals? 10. (=6%). If an organization in the detective force existed whose influence and tendency was to break down departmental organization and efficiency, what would you do? 11. (=6%). What traits of character or personality are essential in the makeup of a successful detective? 12. (=6%). To what extent and by what method should instructions be given to the detective force? 13. (=6%). How are pickpockets usually detected when operating? 14. (=6%). How can the head of a force of detectives develop the characteristics in the individuals under him so as to make them expert in particular lines of work? 15. (=6%). Mention the various methods used by Detective Bureaus for the identification of criminals and give a brief description of each. 16. (=6%). What facts or considerations would govern you in selecting a man to take up a difficult and intricate piece of detective work? 17. (=6%). Outline a system of reports, etc., which would properly record the operations of the Detective Bureau.

LIEUTENANT OF DETECTIVES, BUREAU OF POLICE, DEPARTMENT OF PUBLIC SAFETY, \$2,200 a year (Promotion), May 19,

*Training and Experience—Weight 5.* See examination for Captain of Detectives, held April 28.

*Practical Questions—Weight 5.* 1. (*Credit=8%*). Name some of the important classes of criminals with which a Detective

Bureau has to deal. 2. (=8%). Describe the methods of operation peculiar to any two of these general classes. 3. (=8%). Describe proper methods of procedure on the part of the Detective Bureau to detect and apprehend criminals of these two classes. 4. (=8%). Give a general statement of the relations which exist between the Detective Bureaus of the country calculated to facilitate the apprehension of criminals. 5. (=8%). Tell how the Detective Bureau can effectively co-operate with the uniformed force in the Bureau of Police. 6. (=8%). Give a complete definition of a warrant, stating all its essential features. 7. (=8%). Within what jurisdiction may a warrant, issued by a Philadelphia magistrate, be executed? 8. (=8%). How long is a warrant good, and state any conditions that will terminate the life of a warrant. 9. (=8%). What is a Search Warrant, and give its manner of execution and return. 10. (=8%). Name ten crimes classed as felonies, and ten classed as misdemeanors. 11. (=10%). A large parade is to be held in the City, and during the week many strangers will be in town. The Captain of Detectives is out of the City. You, as Lieutenant of Detectives, are in charge of the Bureau. State in detail what action on your part this situation would call for. 12. (=10%). The body of a man was found early one morning in Fairmount Park. The condition of the ground showed that there had been a fight, and the victim's clothes were torn. A bruise was found on his head. State in detail what a detective assigned to this case should do.

SERGEANT (Promotion), BUREAU OF POLICE, DEPARTMENT OF PUBLIC SAFETY, \$1,200-\$1,400 (Inc.) a year, October 18, 19 and 20.

*Training and Experience—Weight 3.* 1. What is your age? 2. What education have you had? How far did you go in school? Where? 3. Give in order the positions you have held in the Police Service from the time of your appointment as sub-patrolman, with the dates and length of service in each of the districts served in. 4. Give full particulars of any special work to which you have been assigned by the Department. 5. Have you ever been out of the Police Service any time since you entered it? If so, why? What did you do during that time? Have you ever been suspended or demoted? When, why, how long? Have you ever been "called to the front" to answer charges? If so, give full details. 6. Have you ever served in any other organiza-

tion of military or police character? When, where, how long? When were you discharged?

*Practical Questions—Weight 4.* 1. (*Credit=10%*). If you were on patrol as Sergeant and failed to find a certain officer on his beat, what precise course would you follow, and how would you have the beat covered, if the patrolman continued to absent himself? 2. (*=10%*). The possibility that finger impressions may have been left by the criminal necessitates what immediate action by members of the force on arriving at the scene of a crime of violence? 3. (*=10%*). If you found a person in the street seriously injured so that he or she needed immediate medical attention, state what is required of you under the rules of the Police Bureau. 4. (*=10%*). On your rounds as Sergeant you find a patrolman unfitted for duty through intoxication. Under the circumstances, what would be your duty at the time and afterwards? 5. (*=10%*). A patrolman arrests a notorious criminal who is wanted by the police of several cities. A newspaper reporter states that his paper is very much interested and that it will give the patrolman \$200 for a signed article giving details of the circumstances leading to the arrest. What rules of the Department should the patrolman explain to the reporter? 6. (*=10%*). What are the restrictions upon the use of fire-line badges? What persons may pass the fire lines without them? 7. (*=10%*). What do the rules say about dying declarations? An officer under the influence of liquor? Arrests of drivers of mail wagons? 8. (*=10%*). If assigned as Acting Lieutenant in charge of a Police District and you have occasion for some reason to leave the station house, what should you do before going and on returning? 9. (*=10%*). Name the diseases which must be reported to the station house should they occur in a policeman's family, so that the public health may not be endangered? 10. (*=10%*). Under what circumstances and restrictions may a person be permitted to hold conversation with a prisoner in the cell of a station house?

*Oral Test—Weight 3.*

#### SUPPLEMENTARY EXAMINATION

SERGEANT (Promotion), BUREAU OF POLICE, DEPARTMENT OF PUBLIC SAFETY, \$1,200-\$1,400 (inc.) a year, October 23.

*Training and Experience—Weight 3.* See examination for Sergeant, held October 18, 19 and 20.

*Practical Questions—Weight 4.* 1. (*Credit=10%*). On your rounds as Sergeant you find a number of workmen digging up the footway from house line to curb, for the purpose of constructing a vault. What would be your duty and what action would you take? Specify ordinance relating to the same. 2. (*=10%*). As a Sergeant of Police patrolling your district, you find a newly paved street, which is closed to traffic, at each end, under orders from the Chief of the Bureau of Highways by having poles placed across. A person driving any kind of a vehicle takes down pole at one end to drive in on street. What action would you take? Specify ordinance relating to the same. 3. (*=10%*). What Bureau does the construction of sewers come under? Specify ordinance relating to the same. 4. (*=10%*). On your rounds as Sergeant you find a person or persons cutting, breaking, injuring or destroying any shade or ornamental tree upon any sidewalk or elsewhere in the City of Philadelphia. What action would you take? 5. (*=10%*). On your rounds as a Sergeant you are informed by a person that a man or a woman is exposing for sale and exhibiting indecent, lewd or obscene print, painting or photographs. What would be your duty, and what action would you take? 6. (*=10%*). You as Sergeant, having reported off duty, and on your way home, are approached by a man or woman who tells you that a man has kidnapped his or her daughter or son, 8 years old. What would be your duty, and what action would you take? 7. (*=10%*). On your rounds as a Sergeant you are informed by a person that a fire escape on a large factory is obstructed by barrels, boxes or other rubbish to the detriment of the employees in case of conflagration. What would be your duty and what action would you take? 8. (*=10%*). What is the ordinance relating to building material on the public highway? Also, as to the obstruction of fire plugs? 9. (*=10%*). What would be required in front of a building being erected for the protection and safety of pedestrians traveling by such building? 10. (*=10%*). What would be required by the owner of a property, tenant, contractor or manufacturer to erect an iron awning? How should it be erected and what height? Specify the ordinance on same.

*Oral Test—Weight 3.*

DETECTIVE (Promotion), BUREAU OF POLICE, DEPARTMENT OF PUBLIC SAFETY, December 21.

*Training and Experience—Weight 5.* For Questions 1 to 6,

inclusive, see examination for Sergeant, held October 18, 19 and 20. 7. What experience have you had that in your opinion qualifies you for the position of detective?

*Practical Questions—Weight 5.* 1. (*Credit=10%*). Tell what constitutes the proper organization of a Detective Division in a large city and state in detail the duties with which such a Detective Division is charged. 2. (*=10%*). What are the important qualifications of a successful detective? Discuss this question from the personnel, mental and moral standpoint. 3. (*=10%*). What essential information and equipment does a detective obtain only by actual experience in this line of work? 4. (*=10%*). What do you understand by the term "professional bank sneak"? Discuss in detail how this class of criminals operates, and set forth in detail how you would work on a case of this sort and what measures you would take to apprehend individuals engaged in this line of work. 5. (*=10%*). Define a warrant. Tell by whom a warrant may be issued. Where should return be made? Where may a warrant be executed? Why should an officer carefully examine a warrant received by him? 6. (*=10%*). Define clearly and fully what is meant by "legal evidence." 7. (*=10%*). You are assigned to a murder case immediately upon the discovery of the crime by a patrolman on the beat. State what would be your line of procedure and your full duty in connection with the case. 8. (*=10%*). Tell under what conditions an officer is justified in breaking open a door. 9. (*=10%*). Define the following crimes and also state whether they are felonies or misdemeanors: (a) burglary; (b) larceny; (c) assault; (d) forgery; (e) perjury. 10. (*=10%*). The Police Department of Philadelphia is at present confronted with the problem of automobile thefts. Write a report of about 250 words, addressed to the Superintendent of Police, setting forth your own ideas for the solution of this problem. Sign this report "*John Doe.*"

# **INSPECTION SERVICE**

PIPE INSPECTOR, BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$1,000-\$1,200 (inc.) a year, January 6.

*Training and Experience—Weight 3.* Note:—In answering the questions on experience, the statements made must be clear and concise, giving all dates necessary to show the length and character of experience. Any false statement made by the applicant in answering these questions will be regarded as good cause for excluding him from the eligible list, or for removal or discharge during probation or thereafter. Neither your name, nor any name tending to disclose your identity, is to be written on or signed to these papers.

1. What is your age?....years....months.

2. Did you attend Grammar School? (Yes or no.) If so, fill in the following: (a) Date of entrance; (b) date of graduation or leaving; (c) reason for leaving; (d) if you were not graduated, state the grade you were in when you left.

3. Did you attend High School? (Yes or no.) If so, fill in the following: (a) Name of school; (b) course pursued; (c) date of entrance; (d) date of graduation or leaving; (e) reason for leaving; (f) if you were not graduated, state the class you were in when you left.

4. Did you attend a Technical School? (Yes or no.) If so, fill in the following: (a) Name of school; (b) date of entrance; (c) date of graduation or leaving; (d) course pursued; (e) reason for leaving; (f) if you were not graduated, state the class you were in when you left.

5. Did you attend any evening schools? (Yes or no.) If so, fill in the following: (a) Name of schools; (b) courses pursued at each school; (c) date of entrance; (d) date of graduation or leaving; (e) what was your daily occupation while attending evening school?

6. (a) What is your trade or occupation? (b) What training did you receive for it? (All dates must be given in answering the above.) (c) How long have you followed it?....years....months.

7. State in order of time the positions you have held, giving the dates of entering and leaving; names and addresses of your employers; the nature of the work; salary received, and reasons for leaving in each case.

8. Give the names and addresses of your employers whom you would be willing to have consulted as references.

9. State any other experience or training you have had

that would tend to fit you for the position which you are now seeking.

*Practical Questions—Weight 7.* 1. (*Credit=6%*). State the difference between pig iron and cast iron. 2. (*=5%*). State the proper percentage, in the composition of gray cast-iron, of: (a) Carbon; (b) silicon; (c) phosphorus; (d) manganese; (e) sulphur. 3. (*=5%*). If the percentage of manganese, in the composition of cast iron, is too low, how does this affect the material? 4. (*=5%*). What is the melting point of gray cast iron in degrees Fahr.? 5. (*=8%*). State the following physical properties of ordinary cast iron, in pounds per square inch (ultimate): (a) Tension; (b) compression; (c) shearing; (d) bending (extreme fibre). 6. (*=12%*). Sketch, neatly: (a) An offset; (b) a  $\frac{1}{8}$ -inch curve (state degrees); (c) an "L"; (d) a cross; (e) a "Y" branch; (f) a "blow-off" branch. 7. (*=12%*). Describe, in detail, the procedure in testing an 8-inch cast-iron water pipe. Name the equipment an inspector should have available for testing. 8. (*=12%*). Describe, in detail, the methods used to secure a perfect 24-inch cast-iron water pipe. 9. (*=25%*). Write out, as fully as possible, your knowledge of the "Standard Specifications," under the following headings: (a) Allowable variation in diameter; allowable variation in thickness; and percentage variation in weight; (b) defective spigots; (c) special castings; (d) marking; (e) quality; (f) tests; (g) cleaning and inspection; (h) coating; (i) weighing; (j) transportation. 10. (*=10%*). Write a report of about 200 words, addressed to the Chief Inspector and signed "John Doe," covering an inspection of cast-iron pipe of various sizes, together with some special castings, where a considerable percentage of the material (in at least four different ways) failed to pass the requirements of the specifications. This report will be graded for legibility of writing, clearness of expression, and logical presentation of subject matter.

ASSISTANT INSPECTOR OF METERS, BUREAU OF GAS, DEPARTMENT OF PUBLIC WORKS, \$750-\$900 (inc.) a year, January 7.

*Training and Experience—Weight 3.* 1. What is your age? .... years....months. 2. Did you attend Common School? (Yes or no.) How far did you go in Common School? Did you attend Grammar School? (Yes or no.) How far did you go in Grammar School? Did you attend High or Trade School? (Yes

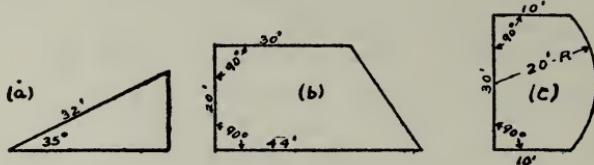
or no.) What High or Trade School did you attend? Did you graduate from High or Trade School? (Yes or no.) What year did you enter? What year did you leave? Did you attend College? (Yes or no.) What College did you attend? What course did you take? Did you graduate? (Yes or no.) What year did you enter? What year did you leave? 3. Have you ever attended night school while employed? (Yes or no.) What night school did you attend? What course or courses did you take? Did you complete the course or courses? (Yes or no.) How many nights a week and how many hours a night did you attend? ....nights....hours. How long did you attend?....years....months. 4. Have you ever been employed as an inspector of any nature? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 5. Have you ever been employed as a gas-meter prover? (Yes or no.) If you answer yes, give details asked in fourth question. 6. Have you any other trade or occupation which you think would fit you for this position? (Yes or no.) If you answer yes, give details asked in fourth question. 7. Give in detail any other work which you have done that would tend to fit you for this position.

*Practical Questions and Computations—Weight 7. 1. (Credit=10%).* Describe, in detail, a complete capacity test of a gas meter. 2. (=10%). Give a description of and explain the use of the following: (a) Sampling bottle; (b) calorimeter (gas); (c) barometer; (d) standard candle; (e) meter prover. 3. (=10%). Explain the principles of a gas photometer. 4. (=10%). The standard lamp in a photometer is 4 candlepower and the balance is found 26 cm. from the standard. If the length of the photometer scale is 100 cm., what is the candlepower of the lamp under test? 5. (=10%). What is Boyles' Law? 6. (=10%). What is Charles' Law? 7. (=10%). A closed cylindrical tank with water inlet and air outlet has the following dimensions: Diameter inside  $3\frac{1}{4}$  ft., height 6 ft. The tank contains 1' 7" of water. If the height of the water is increased to 4' 3", what was the original volume of air and how much air was expelled? 8. (=10%). Convert the following units: (a) 25 cm. to inches; (b) 10 grams to ounces; (c) 45 degrees F. to degrees C.; (d) 10' 6" to meters and centimeters; (e) 25 lbs. to kilograms. 9. (=10%). Perform the following mathematical calculations:

(a)  $75 \times 43^{2.5} = 3.5 K$  solve for K.

(b)  $\sqrt[1.41]{42.25} = X$  solve for X.

10. (=10%). Find the area and the length of the sides of each of the following figures:



ASSISTANT INSPECTOR, BUREAU OF BOILER INSPECTION, DEPARTMENT OF PUBLIC SAFETY, \$1,300 a year, January 10.

*Training and Experience—Weight 3.* 1. What is your age? ....years....months. 2. Did you attend Common School? (Yes or no.) Did you attend Grammar School? (Yes or no.) How far did you go in school? 3. Did you serve an apprenticeship as a boilermaker? (Yes or no.) If you answer yes, fill in the following: Under whom you served; name; address; date beginning; date ending; length of time served. 4. Have you ever been employed as a boilermaker? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 5. Have you ever been employed as a stationary engineer? (Yes or no.) If you answer yes, fill in the following: Give details asked in fourth question. 6. Have you ever been employed as a boiler inspector? (Yes or no.) If you answer yes, give details asked in fourth question. 7. Give, in detail, information concerning any work you have done not mentioned above which would tend to fit you for this position.

*Practical Questions—Weight 7.* 1. (*Credit=4%*). In making up a boiler seam, should the rivet holes be punched and reamed and why? 2. (=5%). What clearance should rivets have in hole before driving? Why should this amount be allowed? 3. (=8%). What is the best method of riveting new work? Give your reasons for selecting this method. 4. (=10%). How should ends of plates be scarffed and why? 5. (=10%). Explain how the edges of a plate should be prepared for rolling. Why is this done? 6. (=8%). Where should the seams of plates be located in a horizontal tubular boiler? Why are they

so placed? 7. (=5%). What is the best method of caulking? Explain how this is done. 8. (=8%). If a steam dome is placed on a horizontal boiler, where should the seam of the dome be located and why? 9. (=10%). Explain, in detail, how you would make a complete internal inspection of a tubular boiler. 10. (=10%). Explain, in detail, how you would make a complete outside inspection of a tubular boiler. 11. (=12%). A steam drum of a boiler 48" diameter carries a pressure of 150#/sq. in. The circular seam is a double riveted lap joint with  $\frac{3}{4}$ " rivets, pitch  $2\frac{1}{2}$ " from center to center all ways. The plate is  $\frac{5}{8}$ " thick. The ultimate tensile strength of the plate is 55,000#/sq. in., the ultimate shearing strength of the plate is 45,000#/sq. in. If the rivet steel has the same tensile and shearing strength as the plate: 1. What will be the greatest pressure the seam will stand? 2. What will be the efficiency of the joint? 3. What is the factor of safety at which the joint is being worked? 12. (=10%). The length of the steam drum in question No. 11 is 18'. (a) Is the stress on the steel in the longitudinal joint greater or less than in the circular? (b) Why is this so? (c) How much greater or less is it? (d) How would this joint be riveted, single or double or triple, and why? (e) What would be the efficiency of this joint?

SEWER INSPECTOR (BRANCH SEWERS) (25 years or over)  
(must be Bricklayers), ANY BUREAU, ANY DEPARTMENT, \$5 a day, January 11.

*Training and Experience—Weight 5.* For Questions 1 to 8, see examination for Pipe Inspector, held January 6. Give the most important sewer work you have done. 9. Have you ever worked on brick sewers? (Yes or no.) In what capacity? Give sizes of sewers. When? Where? For whom? 10. Have you ever worked on terra cotta sewers? (Yes or no.) Give details asked in ninth question. 11. Have you ever worked on concrete sewers? (Yes or no.) Give details asked in ninth question. 12. Have you ever worked on brick manholes or inlets? (Yes or no.) Give details asked in ninth question. Give the most important work you have handled in a supervising capacity—either as *foreman* or *inspector*. 13. Have you ever worked on concrete construction? (Yes or no.) Give details asked in ninth question. 14. Have you ever worked on brick construction? (Yes or no.) Give details asked in ninth question. 15. Have you ever worked on

masonry construction? (Yes or no.) Give details asked in ninth question.

*Practical Questions—Weight 5.* 1. (*Credit=12%*). Name and briefly describe three defects that will justify rejecting vitrified clay pipe. 2. (*=12%*). Give two causes for rejecting a sand, and tell how you would test for each of them. 3. (*=12%*). Give the usual specification for crushed stone or gravel. Give a sample method of distinguishing limestone from other stones. 4. (*=12%*). What requirements must brick meet to be satisfactory for sewer work? 5. (*=12%*). Describe the proper method of back-filling a sewer trench 20 ft. deep in loamy soil. 6. (*=10%*). What sheeting and bracing should have been used in this trench, and what must be done with it in back-filling? 7. (*=20%*). A 5' x 7½' egg-shaped brick sewer is to be built. Give, in detail, the method of construction, including that of the concrete cradle. 8. (*=10%*). In inspecting a vitrified pipe sewer you find several leaks through one of which a poplar root has entered and grown. How can you get rid of the roots and stop the leak?

STEEL INSPECTOR (18 years or over), DEPARTMENT OF CITY TRANSIT, \$1,500-\$1,800 a year, or \$5-\$6 a day, February 3.

*Training and Experience—Weight 4.* See Questions 1 to 8, for examination for Pipe Inspector, held January 6.

*Practical Questions—Weight 6.* 1. (*Credit=5%*). What kind of steel is considered best for structural material? 2. (*=5%*). How should tensile strength, limit of elasticity and ductility be determined? 3. (*=5%*). What should be the ultimate strength of soft steel, its elastic limit and what test should it be given? 4. (*=5%*). What should be the character of fracture of structural, rivet steel and steel castings? 5. (*=5%*). What should be the finished condition? 6. (*=5%*). What should weight of rolled sections be per cu. ft.? 7. (*=5%*). How should angles be tested? 8. (*=5%*). How much larger than rivet should punch and die be? 9. (*=5%*). Should fillets be considered in calculating weights of sections and why? 10. (*=5%*). How should material be treated before painting? 11. (*=5%*). What are the pigments used for painting and what are they usually mixed with? 12. (*=5%*). What is the best method of driving rivets and why, and how should they be tested? 13. (*=5%*). In assembling before being shipped, what are the principal things to be looked for? 14. (*=5%*). What percentage

of variation of weight of cross section should be sufficient for rejecture? 15. ( $=5\%$ ). What is the difference of methods of forming bases of columns resting on steel slabs or castings and those resting on masonry? 16. ( $=5\%$ ). Give method of fastening rails to runway beams. 17. ( $=5\%$ ). Which is the better, a punched or drilled hole? 18. ( $=5\%$ ). Why should the use of a drift pin be discouraged, and how should the work be brought together without the pin? 19. ( $=5\%$ ). What is the proper procedure before starting to erect structural material? 20. ( $=5\%$ ). When the following symbols are shown on print in reference to riveting, what do they indicate?

<i>Shop</i>	<i>Field</i>
○	●
⊗	⊗
◎	◎
☒	☒

ASSISTANT INSPECTOR OF METERS, BUREAU OF GAS, DEPARTMENT OF PUBLIC WORKS, \$750-\$900 (inc.) a year, March 3.

*Training and Experience—Weight 3.* See examination for Assistant Inspector of Meters, held January 7.

*Practical Questions—Weight 7.* 1. (*Credit=10%*). How is the illuminating power of gas expressed and how is it determined? 2. ( $=10\%$ ). Describe in detail the burner most commonly used in testing gas. 3. ( $=10\%$ ). How is the calorific power of a gas determined? Explain the construction and use of the apparatus. 4. ( $=10\%$ ). The number of calories multiplied by 3.968 gives British Thermal Units. Show how the constant 3.968 is obtained. 5. ( $=10\%$ ). Explain, in detail, how a sample or samples of gas for testing are collected. 6. ( $=15\%$ ). A portable photometer is equipped with an electric standard lamp operated from storage battery. The photometer bar is graduated to read directly in c. p. Explain, in detail, how you would calibrate the photometer so as to be assured of accurate readings. 7. ( $=13\%$ ). Explain, in detail, the standard method of testing gas meters. What do you understand by the per cent. of error in a meter? 8. ( $=12\%$ ). Explain the effect of pressure and specific gravity on the gas supplied for domestic use. What is the natural conclusion of the specific gravity if the specific gravity is high, and why is this conclusion drawn? 9. ( $=10\%$ ). Name the absorbents used in gas analyzers to remove carbon-monoxide, oxygen and illuminants. In what order are they used and why?

ASSISTANT INSPECTOR, BUREAU OF BOILER INSPECTION, DEPARTMENT OF PUBLIC SAFETY, \$1,300 a year, March 20.

*Training and Experience—Weight 3.* See experience sheet for Assistant Inspector, Bureau of Boiler Inspection, January 10.

*Practical Questions—Weight 7.* 1. (*Credit=10%*). Name five important points to be looked out for in an internal inspection of a return tubular boiler. 2. (*=10%*). How are the rivets in a boiler seam tested for soundness? What is done with a rivet which is not sound? 3. (*=5%*). Explain how a rivet is hand driven. 4. (*=5%*). In a double-riveted lap joint, which is the stronger, chain riveting or staggered riveting? Why is this the stronger? 5. (*=10%*). What is the objection of a double-riveted lap joint on a fire seam? Which type of seam is best for a fire seam? 6. (*=10%*). What grade of steel is used for boiler tubes? How should they be formed? 7. (*=10%*). How can it be determined that a tube needs rolling? 8. (*=10%*). Where are the following parts of a boiler located: (a) Crown bars; (b) diagonal braces; (c) staybolts; (d) crownsheet; (e) fusible plug? 9. (*=10%*). Explain fully how each of the following repairs to a boiler should be made: (a) Blistered sheet on a return tubular boiler directly above the fire; (b) fire crack in a lap seam running from a rivet directly out to the edge of the plate; (c) rotted mud ring in a vertical boiler? 10. (*=10%*). What would be the allowable pressure on a return tubular boiler 72" in. diameter, 18' long, 5/8" plate to put a stress of 12,000 lbs. per square inch in the metal? 11. (*=10%*). Make a sketch showing the location of the gauge glass and try cocks on a boiler, and also showing the piping and valve from a return tubular boiler to the gauge glass and try cocks.

ELEVATOR INSPECTOR, BUREAU OF ELEVATOR INSPECTION, DEPARTMENT OF PUBLIC SAFETY, \$1,000-\$1,200 a year, March 20.

*Training and Experience—Weight 2.* 1. What is your age? 2. Did you attend Common School? (Yes or no.) Where did you attend Common School? How far did you go in Common School? Did you attend Grammar School? (Yes or no.) How far did you go in Grammar School? Did you attend High School? (Yes or no.) If you answer yes, state the following: Where did you attend High School? What year did you enter? What year did you leave? Did you graduate? (Yes or no.) 3. Have you attended any other educational school? (Yes or no.) If you

answer yes, give below the details. 4. Have you ever worked as an elevator machinist or constructor? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 5. Have you ever worked as an elevator inspector? (Yes or no.) If you answer yes, give details asked in fourth question. 6. Have you any other trade or occupation? (Yes or no.) If you answer yes, give details asked in fourth question. 7. Give below detailed information concerning any other work you have done not mentioned above which would tend to fit you for this position.

*Practical Questions—Weight 5.* 1. (*Credit=10%*). Make a sketch of and explain the running rope system of elevator control. 2. ( $=10\%$ ). Explain the operation of a safety clutch. How is it tested? 3. ( $=10\%$ ). What method is used to prevent a car going up beyond the safe limit in the shaft? How is this device tested? 4. ( $=10\%$ ). What is the purpose of the pilot valve on a hydraulic elevator? How can it be determined whether it can be controlled by the interlock within the limits of two-thirds of its total lap? 5. ( $=10\%$ ). How are the relays tested on an electric traction elevator? 6. ( $=10\%$ ). What principal things must be known in order to obtain the safe-carrying capacity of an elevator? How are these determined? 7. ( $=10\%$ ). How is the amount of counterbalance on an elevator determined? 8. ( $=10\%$ ). Outline the inspection necessary on a plunger-type hydraulic elevator to determine its safety. 9. ( $=10\%$ ). What in the operation of a plunger-type hydraulic elevator would indicate a cracked cylinder below the level of the stuffing box? 10. ( $=10\%$ ). What effect has stretching of the cables of an elevator on its operation? What amount of stretch is it safe to expect in a new cable  $\frac{3}{4}$ ", 6 strands, 19 wires each, whose total length is about 300 feet?

*Laws and Ordinances—Weight 2.* 1. (*Credit=10%*). How must counterweights be fastened together? 2. ( $=10\%$ ). What equipment is required on passenger cars? 3. ( $=15\%$ ). When is an elevator classed as a passenger elevator? 4. ( $=15\%$ ). Give three distinct requirements of elevator-locking devices. 5. ( $=15\%$ ). When it is impossible to place a mechanical interlock in a basement door, what must be done? 6. ( $=15\%$ ). On an inspection the following conditions are found: A back-guide elevator equipped with power; the drum constructed of wood;

a double cable used and attached directly to the top of the car. Is the elevator properly constructed and running in accordance with the City ordinances? If not, where is it at fault? What steps would be taken to correct faults, if there are any? 7. (=10%). When is a governor required on a freight elevator? 8. (=10%). What is required of brakes operated by a check line?

*Report Writing—Weight 1.* Supposing that an accident occurred this morning in one of the elevators in the Land Title Building, resulting in the injury of a passenger, write a letter to the Civil Service Commission outlining how you would proceed to investigate the case to determine the cause of the accident. Sign this letter "*John Doe.*" The following elements will be considered in grading this report: Form, 20; grammar, 20; spelling, 10; penmanship, 10; ideas, 40.

ASSISTANT INSPECTOR, BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$1,000-\$1,200 (inc.), a year, March 22.

*Training and Experience—Weight 2.* 1. What is your age? ....years....months. 2. Did you attend elementary school? (Yes or no.) What grade did you reach? 3. Did you attend Grammar School? (Yes or no.) If so, fill in the following: (a) Date of entrance; (b) date of graduation or leaving; (c) reason for leaving; (d) if you were not graduated, state the grade you were in when you left. 4. Did you attend High School? (Yes or no.) If so, fill in the following: (a) Name of school; (b) course pursued; (c) date of entrance; (d) date of graduation or leaving; (e) reason for leaving; (f) if you were not graduated, state the class you were in when you left. 5. Did you attend any evening schools? (Yes or no.) If so, fill in the following: (a) Names of schools; (b) courses pursued at each school; (c) date of entrance; (d) date of graduation or leaving; (e) what was your daily occupation while attending evening school? 6. Have you ever been engaged in building or construction operation? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 7. Have you a trade? (Yes or no.) If you answer yes, give details asked in sixth question. 8. If you have no trade, what is your occupation? How long have you followed it?....years....months. Give details

asked in sixth question. 9. Have you ever worked as an inspector? (Yes or no.) If you answer yes, give details asked in sixth question. 10. Give below, in detail, any other information not mentioned above which would fit you for this position.

*Practical Questions—Weight 4.* 1. (*Credit=16%*). Name four public nuisances. 2. (=12%). How are the nuisances given in answer number one corrected? 3. (=10%). The basement of a tenement house is rented to be used as a rag shop. What action should be taken? 4. (=12%). Is it permissible to have water closets located in sleeping apartments? State your reasons. 5. (=16%). Describe in detail the method of inspecting a house for insanitary conditions. 6. (=12%). What should a complete report of the sanitary inspection of a building contain? 7. (=10%). A manure pit with a grate cover is found under the pavement in a residential section of the city. What action should be taken? 8. (=12%). How should you go from City Hall to each of the following places; and state the route you would take: (a) Carlisle and Jackson streets; (b) Fifty-second and Lansdowne avenue; (c) Fifteenth and Ranstead streets; (d) Howard and Master streets; (e) 248 E. Walnut lane, Germantown; (f) Twenty-first and Ontario streets?

*Report Writing—Weight 2.* Write a report of about 150 words to the Chief of the Division of Housing and Sanitation on the insanitary condition of a tenement house, assuming any circumstances you wish. Sign this report "*John Doe.*" Penmanship, spelling, form, grammar and ideas will be considered in grading this report.

*Personal Fitness—Weight 2.* This subject will be graded in an oral interview. •

ENGINEER INSPECTOR, BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS, \$2,500 a year, March 24.

*Training and Experience—Weight 4.* NOTE:—In answering the questions on Experience, the statements made must be clear and concise, giving all dates necessary to show the length and character of experience. Any false statement made by the applicant in answering these questions will be regarded as good cause for excluding him from the eligible list, or for removal or discharge during probation or thereafter. Neither your name, nor any name tending to disclose your identity, is to be written on or signed to these papers. 1. What is your age?....years....months. 2. (a) What Grammar School did you attend? What grade were you in when you left Grammar School? (b) Give the

following information concerning the High or Preparatory Schools you have attended: Names of schools; location of schools; length of time spent in each; course pursued; dates of graduation or leaving. (c) Give the following information concerning any technical course you have pursued: Name of school; course pursued; date entering; date leaving. If you have not been graduated, state the reasons and tell the class you were in and what subjects you covered before leaving. 3. Have you ever supervised the work of an employee? If so, give complete details. 4. What has been your experience in an executive capacity? 5. From what positions have you been discharged? For what causes? 6. Give the names and addresses of five employers, if possible, whom you would be willing to have consulted as reference. 7. State your practical experience in engineering. State your practical experience in actual inspection of steel work. Has your experience been continuous? (Yes or no.) How many years of office work? How many years of field work? 8. Have you made investigations or written articles on any of the subjects enumerated in Question No. 7? 9. State by whom and where employed. Give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 10. State any other experience or training you have had that would tend to fit you for the position which you are now seeking.

*Technical Questions—Weight 4.* 1. (*Credit=10%*). What do you look for in the inspection of structural steel work at mills, shops and in field? 2. (*=6%*). What is the difference between Open Hearth and Bessemer Steel in method of manufacture and in physical properties? 3. (*=6%*). What is meant by "elastic limit," and how can it be determined accurately and how is it determined in the usual testing at mills? 4. (*=8%*). What is the best method of preserving steel structures against corrosion? 5. (*=10%*). How is lumber classified, and what do you look for in the inspection of lumber? 6. (*=10%*). What do you look for in the inspection of masonry? 7. (*=8%*). Describe briefly different types of movable bridges, with their relative advantages. 8. (*=6%*). Design a wooden beam of 20 ft. span to carry a load of 10 tons concentrated at a point 8 ft. from one support. 9. (*=10%*). Write a specification for riveting; also a specification for painting. 10. (*=6%*). What should be the physical properties of cement, sand and stone for concrete and how are they determined? 11. (*=10%*). How do you deter-

mine the safe bearing capacity of the soil in a foundation? 12. (=6%). Sketch a design and details for a wooden centering for a 60 ft. clear span stone segmental arch of 10 ft. rise and 2 ft. thickness of ring. 13. (=4%). Describe different methods of finishing the surface of concrete and discuss their relative advantages.

*Personal Fitness—Weight 2.* This subject will be graded in an oral interview.

PIPE INSPECTOR, BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$1,000-\$1,200 a year, March 24, 1916.

*Training and Experience—Weight 3.* See examination for Pipe Inspector, held January 6.

*Technical Questions—Weight 5.* 1. (*Credit=20%*). Describe, in detail, the methods employed in casting pipe and connections, including the making of moulds, and give each process of the operation. 2. (=10%). What points do you look after in the inspection of cast-iron pipe. 3. (=10%). Describe the tests applied to the finished pipe and the tests to determine the quality of metal. 4. (=10%). Write a specification for cast-iron water pipe, including various coatings. 5. (=10%). How does the foundry vary the quality of the iron? 6. (=10%). What defects is pipe subject to that will be cause for rejection? 7. (=10%). What precautions would you take in the loading and shipping of large pipe to prevent injury? 8. (=10%). Write a report of about 200 words to the Chief of your Bureau covering a case where you rejected some pipe. 9. (=10%). Describe by sketches the various standard fittings.

*Personal Fitness—Weight 2.* This subject will be graded by an oral interview.

SEWER INSPECTOR (BRANCH SEWERS) (25 years or over) (must be bricklayers), ANY BUREAU, ANY DEPARTMENT, \$5.00 a day, March 24.

*Training and Experience—Weight 5.* See examination for Sewer Inspector, held January 11.

*Practical Questions—Weight 5.* 1. (*Credit=10%*). Explain the proper method of sampling a consignment of cement to be used on sewer work. 2. (=10%). Give two simple methods of inspecting sand and explain the object of each. 3. (=10%). How can you tell an underburned brick? 4. (=10%). What are the requisites of yellow pine piles for sewer work? 5.

(=25%). Describe in detail the method of constructing a 5'-0" reinforced concrete circular sewer in marshy soil. 6. (=20%). (a) Draw a sketch of a grate-top inlet, showing the vertical section. (b) Describe the method of constructing the inlet. 7. (=15%). Compute the number of cubic yards of concrete in the cradle for a 4'-6" circular brick sewer with the following dimensions: Depth of cradle below springing line, 3'-4 1/2"; width of concrete at springing line, 1'-0"; depth of invert, 4 1/2"; batter of faces, 2" to 1'-0"; length, 495'.

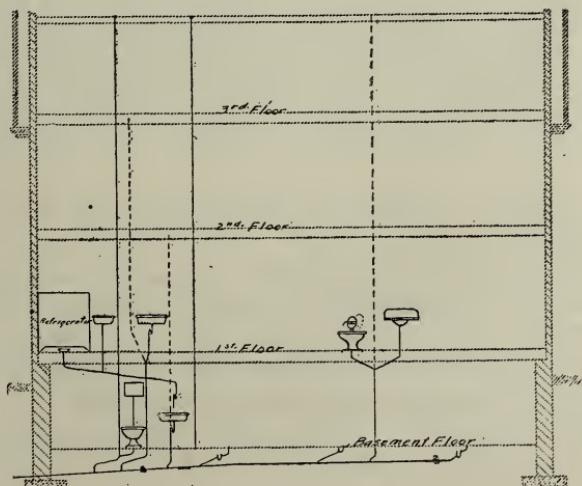
HOUSE DRAINAGE INSPECTOR, BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$1,300 a year, March 27.

*Training and Experience—Weight 2.* For Questions 1, 2, 3, 4, 5, 7, 8, 9 and 10, see Questions 1, 2, 3, 4, 5, 6, 7, 9 and 10, in examination for Assistant Inspector, Bureau of Health, March 22. 6. Are you a licensed plumber? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position.

*Practical Questions—Weight 5.* 1. (*Credit*=5%). How is the formation of a vacuum in a waste pipe prevented? 2. (=5%). (a) State the minimum and maximum size pipe permissible for main house drains. (b) What is the least grade per foot at which they should be laid? 3. (=5%). Under what conditions is it permissible to use terra cotta pipes for drainage and how should they be laid? 4. (=5%). (a) How many small fixtures are permitted to be drained on a 2-inch pipe? (b) If the building is more than five stories in height, what size should the pipe be? 5. (=5%). In running a 4-inch anti-siphon pipe, what is the greatest number of 4-inch traps permitted on it and what is the maximum length? 6. (=5%). Tell what requirements or specifications all cast-iron pipes and fittings must meet, and state the approximate difference in weight per foot between standard and extra heavy cast-iron pipe 6 inches in diameter. 7. (=5%). What is the least allowable thickness for lead bends and traps for water closets and slop hoppers? 8. (=5%). Is there any objection to placing two traps between a fixture and the house drain? Give reasons for your answer. 9. (=5%). How many water closets must be provided in a lodging house accommodating sixty-five persons? 10. (=5%). What is the required

capacity of water-closet tanks? 11. (=5%). How is waste disposed of from fixtures below the level of the sewer? 12. (=5%). What is the effect of the pressure of sewer gas on the trap seal? 13. (=5%). (a) What is a trap? (b) What is meant by the seal of a trap? (c) Name several requirements of traps. (d) What conditions or features in the trap itself would make it unsatisfactory? 14. (=5%). How should an overhead waste pipe be supported and how often? 15. (=5%). What would be the effect of connecting a fixture overflow to the wrong side of the trap? 16. (=5%). How should a connection between a lead pipe and a galvanized iron pipe be made? 17. (=5%). Name several ways in which the seal of a trap may be broken. 18. (=5%). What is the proper connection of a vertical line of soil or waste pipe into the horizontal line? 19. (=5%). What are the advantages of open plumbing? 20. (=5%). What test or tests should be applied to a plumbing system before finally passing it? Describe one of them.

*Report Writing—Weight 2.* Write a report to Hon. Nicholas Albrecht, Civil Service Commissioner, Philadelphia, pointing out the plumbing defects on the attached blueprint and tell how they should be corrected. Sign this report "John Doe." In grading this report penmanship, form, spelling, as well as the accuracy of the report, will be considered.



INSPECTOR, BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$1,000 a year, March 28.

*Training and Experience—Weight 2.* See Questions 1 to 8, examination for Pipe Inspector, held January 6.

*Practical Questions—Weight 3.* 1. (*Credit=10%*). Name the usual fixtures found in a modern bathroom, and state the charges for which these would be assessed according to the existing water rent schedule. 2. (*=10%*). How would you make a complete inspection of an ordinary dwelling so as to be sure that no water fixtures are missed? 3. (*=10%*). Suppose that upon inspecting a property you found a yard hydrant leaking, what would you do? 4. (*=10%*). Assume a charge of \$1.00 a year for washing an automobile, how would you proceed to fix the assessment of a large garage so as to be sure that you had included all the automobiles? 5. (*=10%*). If the occupants of a building objected to your entering for the purpose of making an inspection, what action would you take? 6. (*=10%*). Suppose you had to inspect fixtures in a dark cellar, what special precautions would you take? 7. (*=10%*). How would you examine a water meter to determine that the meter had not been tampered with by the occupants of the property? 8. (*=10%*). Name three kinds of water service which must be metered. 9. (*=10%*). If the consumption of a factory was 1,510 gallons per day for 300 days a year, what would be the charge for water at 30 cents per 1,000 cubic feet, assuming 7 1/2 gallons per cubic foot? 10. (*=10%*). The charge per horse power for gas engines is \$2.00. What would be the water bill for an establishment having the following equipment: 1—15-horsepower engine; 2—35-horsepower engines; 6—8-horsepower engines; 4—135-horsepower engines?

*Personal Fitness Weight 2.* This subject will be graded in an oral interview.

*Report Writing—Weight 2.* Write a letter of about 150 words to Hon. Nicholas Albrecht, Civil Service Commissioner, on the subject: "Water Waste and Its Prevention." Sign this letter "John Doe." The following elements will be considered in grading this report: Form, grammar, spelling and ideas.

*Penmanship—Weight 1.* Penmanship will be graded on the writing in the entire examination.

**INSPECTOR, DEPARTMENT OF WHARVES, DOCKS AND FERRIES,**  
\$900-\$1,000 a year, March 29.

*Training and Experience—Weight 3.* See Questions 1 to 8, examination for Pipe Inspector, held January 6.

*Practical Questions—Weight 7.* 1. (*Credit=9%*). Name three types of dredges and state the special use of each. 2. (=10%). Explain in full how the quantity of dredged material from a dock is estimated. 3. (=10%). (a) What are the causes of wet and dry rot? (b) How can they be distinguished? 4. (=10%). Name another natural destructive agent of timber in marine construction, and tell how it may be identified. 5. (=10%). (a) Name three common methods of preserving timber in marine work. (b) Describe one method in detail. 6. (=5%). What is meant by "puddling"? 7. (=15%). (a) What are the ingredients of concrete? (b) State the proportions usually employed in floor slabs and beams. (c) Describe in detail the method of mixing concrete. 8. (=6%). Make a sketch of a (a) Scarfed joint; (b) clamp splice. 9. (=10%). Compute the number of feet B. M. in the following timber:

No. of Pieces	Size
50	12" x 12" x 24'-6"
60	10" x 12" x 24'-6"
275	3" x 12" x 28'-0"

10. (=15%). Write a report of about 150 words to the Assistant Engineer, Department of Wharves, Docks and Ferries, on the condition of a pier, assuming that you have inspected it. Assume any facts or conditions that you desire. Sign the report "*John Doe.*" The form as well as the subject matter will be considered in grading this report.

**ASSISTANT MILK INSPECTOR, BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES,** \$1,020 a year, May 23.

*Training and Experience—Weight 2.* See Questions 1 to 8, examination for Pipe Inspector, held January 6.

*Practical Questions—Weight 3.* 1. (*Credit=10%*). What is milk? 2. (=10%). What are the component parts of milk? 3. (=10%). What are the most common adulterations of milk? How are they detected? 4. (=10%). Define specific gravity of milk. What information does it give as to the character of milk? 5. (=10%). From what sources does Philadelphia draw its milk supply? 6. (=10%). Give an outline of the duties of a

milk inspector. 7. ( $=10\%$ ). Give five (5) rules governing the preparation and the distribution of a milk supply. 8. ( $=10\%$ ). Name ten diseases known to be communicable through a milk supply. 9. ( $=10\%$ ). What methods are usually employed for the preservation of milk? Define pasteurization and sterilization. How are pasteurized and sterilized milk detected? 10. ( $=10\%$ ). What do you understand by a "Certified Milk"?

*Practical Test—Weight 5.* This will include a practical test with the Lactometer.

SPECIAL INSPECTOR, DIRECTOR'S OFFICE, DEPARTMENT OF PUBLIC WORKS, \$2,500 a year, June 15.

*Training and Experience—Weight 4.* Any false statement made by the applicant in answering these questions will be regarded as good cause for excluding him from the eligible list or for removal or discharge during probation or thereafter.

1. What is your age?
2. Did you attend Grammar School? (Yes or no.) Were you graduated from Grammar School? (Yes or no.) If so, give date of graduation. If you were not graduated, give the date of leaving and the grade you were in when you left.
3. (a) Did you attend High School? (Yes or no.) (b) If you did attend High School, how long did you remain there and on what date (month and year) did you leave High School? (c) If you were graduated from High School, give the date (month and year) of your graduation.
4. (a) Have you pursued any course of study in school (business, trade, technical) since leaving High School? If so, give names of schools, dates of entering and dates of leaving, course or courses pursued, and whether you finished the course or not. (b) If you attended night school, give dates and tell what occupation you followed while attending night school.
5. In general, what is your occupation? How long have you followed it?
6. (a) Give the names, addresses and kind of business of all your employers. (b) State the title of the position you held under each employer, salary you received, the length of time you were employed, giving dates, and the reasons for leaving each employer.
7. From what positions have you been discharged for cause, and what were the causes?
8. State exactly and in detail the kind of work you were doing in each of the leading positions you have filled in the past five years.
9. Give the particulars about any special work you have done, in addition to the above, which tends to qualify you for the position you are now seeking.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). (a) If you were placed in charge of a bureau or division somewhat disorganized, outline your procedure for placing it on a businesslike basis. (b) Describe an office system best adapted to produce satisfactory results, covering personal services of a dozen men. 2. (=10%). (a) If you were requested to follow up all ordinances of a Department, what system would you adopt to give you the best grasp of the whole subject and enable you to know the exact status of any ordinance at any given time? (b) Prepare draft of a typical ordinance for some public work. 3. (=10%). (a) Give an example of best system of indexing for reference records of a single class but many thousand in number. (b) Give the sequence of necessary procedure to accomplish some municipal work, as the construction of sewer, placing a street on plan, etc. 4. (=10%). (a) Give in detail the steps necessary in making a contract. (b) How are payments under contracts accomplished? 5. (=10%). (a) Give a short synopsis of what is requisite in the change of ownership of a property. (b) Describe a system which in your judgment would be an improvement over the present system in this regard. 6. (=10%). (a) Assume that you are sent to inspect the construction of a main sewer. What would be your guide in making such inspection, what would you consider the most important features of the work, and what would be the methods of your examination? (b) Ditto. A street being paved with granite block on a concrete base. 7. (=10%). (a) If you were given a problem to reduce waste of time of the public caused by necessity to visit offices on the first, second, third and seventh floors of City Hall, how would you investigate and how solve it? (b) Outline the peculiar advantages of each class of improved street pavement, and state under what conditions you would use each. 8. (=10%). In an engineering bureau, give a synopsis of the items of work performed respectively by field and office forces from the beginning to the end of a contract for a public work. 9. (=10%). Assume that you have been detailed to examine and report upon a street paving job complained of as being defective. State what you would do and write a report of your findings. 10. (=10%). (a) The opening of an avenue of the City is urgently needed. Many property owners own the street. How would you proceed in a campaign to secure the quickest results? (b) A parkway is to be pushed to completion. Assume conditions and give steps of procedure and recommend,

touching upon all phases, what in your view would quickly secure desired results.

CHIEF STEEL INSPECTOR (Promotion), DEPARTMENT OF CITY TRANSIT, \$1,800 a year, July 21.

*Training and Experience—Weight 4.* See Questions 1 to 8, examination for Pipe Inspector, held January 6.

*Practical Questions—Weight 6.* 1. (*Credit=5%*). What, in your judgment, is the most important test of quality of steel? 2. (=5%). What do light spots in a tension fracture of a bar indicate? 3. (=5%). Under what circumstances would you make a check chemical analysis? 4. (=5%). What variations from the specification requirements as to properties is it customary to permit? 5. (=5%). How do you ascertain whether plates and shapes have been rolled to full specified section, and what variations is it customary to permit? 6. (=5%). What supervision do your inspectors exercise to secure positive identification of your test specimens with the accepted finished material? 7. (=5%). What limitations do you impose on the use of drift pins for bringing work together in assembling at shop and erection in field? 8. (=5%). Is a heavy or a light hammer best for hand driving of rivets? As opinions differ, what theory do you base your opinion on? 9. (=5%). How do you determine whether rivets are acceptable? 10. (=5%). At what limit of thickness of steel is it proper to require sub-punching and reaming, or drilling out of the solid, instead of punching full size, and why? 11. (=5%). What points are important in the inspection of iron castings? 12. (=5%). What inspection do you give to wrought iron pipe? 13. (=5%). What inspection is practicable for galvanizing of both pipe and castings? 14. (=5%). What are the most important points to be looked after to secure a good job of painting? 15. (=5%). Under what circumstances would you permit bolts to be used in place of rivets, and how would you secure them against loosening under subsequent vibration in service? 16. (=5%). If an angle in the flange of a finished girder is found to have a longitudinal crack, and the girder is urgently needed for erection, what would you require to be done? 17. (=5%). What method of straightening a kinked girder in the field would you permit? 18. (=5%). On what principles would you assign various inspectors to work at the mills, shops, and field? 19. (=5%). How would you

handle the matter of making and filing reports, and preserving records for future use in connection with a given structure? 20. (=5%). What reports should the Chief Inspector make for estimates for current and final payments to the contractor, and how should he obtain his data?

INSPECTOR ON CONSTRUCTION, DEPARTMENTS OF WHARVES, DOCKS AND FERRIES AND CITY TRANSIT, \$1,000-\$1,200 a year, September 18.

*Training and Experience—Weight 25.* See Questions 1 to 8, examination for Pipe Inspector, held January 6.

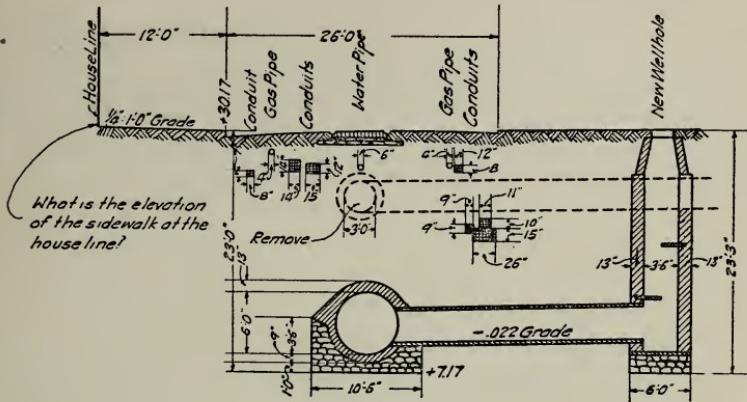
*Practical Questions—Weight 75.* 1. (*Credit=10%*). Assume a reinforced concrete building in the course of construction, describe the essential duties of the Inspector. 2. (=5%). In a general way, describe what an Inspector's daily report should cover. 3. (=20%). *Concrete:* (a) Explain what is meant by the proportioning of the materials used in making concrete, and state the proportions that are most commonly used. (b) Name several makes of mechanical concrete mixers. (c) Is mechanical mixing preferable to hand mixing? Why? (d) What is meant by granolithic finish, and how is it applied? (e) What is meant by reinforced concrete? 4. (=10%). *Brickwork:* Give a concise specification covering the requirements for good brickwork. 5. (=5%). A stick of timber is twenty-four feet (24') long, twelve inches (12") wide and eight inches (8") deep; compute the number of feet board measure. 6. (=10%). Make a sketch of a section of a concrete foundation resting on piles, showing the framing of the timber at the head of the piles and the spacing of the piles. 7. (=10%). Write a short specification for timber piles fifty feet (50') long, to be used in a heavy foundation in this section of the country. State also the method of driving and the requirements of good driving. 8. (=10%). What are the essential differences between Short Leaf and Long Leaf Yellow Pine? Which is used in heavy foundations? Why? 9. (=10%). Name and describe three classes of masonry construction and for what class of work are they applicable? 10. (=10%). Assume a pier three hundred feet (300') wide and five hundred feet (500') long to be filled with earth. State two methods of handling and depositing this material.

INSPECTOR ON CONSTRUCTION, DEPARTMENTS OF WHARVES, DOCKS AND FERRIES AND CITY TRANSIT, \$1,200-\$1,500 a year, September 19.

*Training and Experience—Weight 3.* See Questions 1 to 8, examination for Pipe Inspector, held January 6.

*Practical Questions—Weight 7.* 1. (*Credit=20%*). (a) Give in full a description of the duties of the position of Inspector on heavy construction work, based upon your actual experience and understanding of its requirements. (b) In his relations with the contractor what line of conduct is it essential that he pursue in order to best serve the interests of the work? 2. ( $=5\%$ ). In a general way, describe what an Inspector's daily report should cover. 3. ( $=30\%$ ). *Concrete:* (a) Explain what is meant by the proportioning of the materials used in making concrete, and state the proportions that are most commonly used. (b) Describe a satisfactory method of mixing concrete by hand. (c) Give a concise statement covering the proper rules to be observed in the proper placing of concrete. (d) Explain how to obtain a satisfactory finish for an exposed face of a concrete wall. (e) Should concrete be laid in freezing weather? If so, what precaution should be taken to insure the best results? (f) What precautions should be taken in placing concrete in locations where ground water is met with? (g) What are the requirements for a good concrete sand; for the coarse aggregate? (h) What is meant by reinforced concrete? (i) In the construction of reinforced concrete masonry, what special points require the careful supervision of the Inspector? (j) What are the two principal requirements for concrete forms? How would you determine when the forms could be safely stripped from a concrete structure? 4. ( $=5\%$ ). *Brickwork:* Give a concise specification covering the requirements for good brickwork. 5. ( $=5\%$ ). *Trench Timbering:* Show by sketch the general arrangement and approximate sizes of the timbers you would suggest using in shoring a trench 30 ft. in width at the top and 25 ft. in depth. 6. ( $=5\%$ ). *Backfilling:* (a) In backfilling a trench, what methods are required by good practice to obtain the best results? (b) What materials should be rejected? 7. ( $=5\%$ ). What is meant by: (a) Rubble Masonry? (b) Ashlar Masonry? (c) Rubble Concrete? (d) Concrete Rubble? 8. ( $=5\%$ ). What is meant by the term "specifications" as applied to contract work? 9. ( $=10\%$ ). Explain the meaning of the various figures and dimensions shown on the

accompanying sketch. 10. ( $=10\%$ ). (a) What species of timber is used in heavy foundations in river and harbor work or in false work for heavy steel aqueducts in this section of the country? (b) Write a short specification for timber piling and the requirements and method of driving, the piling to be at least 60 feet long and to be used in foundations.



ASSISTANT INSPECTOR OF TEST BORINGS (SEWAGE DISPOSAL),  
BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS, \$1,000 a  
year, November 8.

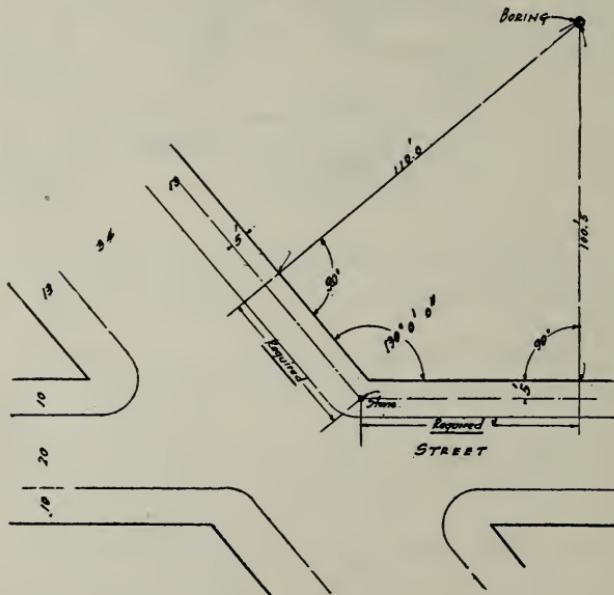
*Training and Experience—Weight 2.5.* See Questions 1 to 8, examination for Pipe Inspector, held January 6.

*Practical Questions—Weight 7.5.* 1. (*Credit=10%*). Describe the apparatus and method used in making wash borings. 2. ( $=10\%$ ). Sketch a profile showing the surface of the ground along the line of a sewer 500 feet long. Show the sewer by two parallel lines. Then place upon the profile the results of imaginary borings taken every 100 feet. 3. ( $=10\%$ ). Two stakes 500 feet apart mark the 5-ft. range of a street. How would you produce this line 100 feet ahead of one of the stakes with a transit? 4. ( $=10\%$ ). A rectangular lot has a front of 225 feet and is 563 feet deep. How many acres does it contain? 5. ( $=10\%$ ). How is topography taken with a plane table? 6. ( $=10\%$ ). A boring is taken adjacent to the curb and 265 feet from a curb corner the elevation of which is + 45.83. For 87 feet from the curb corner the curb ascends at a .043 grade and then ascends at a .0105 grade. The boring indicates hard bottom 18' 3" below the curb. What is the elevation of hard bottom? 7. ( $=10\%$ ).

What is City datum? 8. ( $=10\%$ ). The following are level notes for setting a stake for a boring. What is the elevation of the stake?

+	H.I.	—	E.I.	
5.86			—1.42	B.M. # 18
		10.75		T.P.
3.28			2.09	On stake for boring .

9. ( $=10\%$ ). What data should be obtained for record in taking test borings? 10. ( $=10\%$ ). Using the plan on attached print, calculate the distances necessary for locating a stake at point "A" from the 5-ft. ranges of the streets.

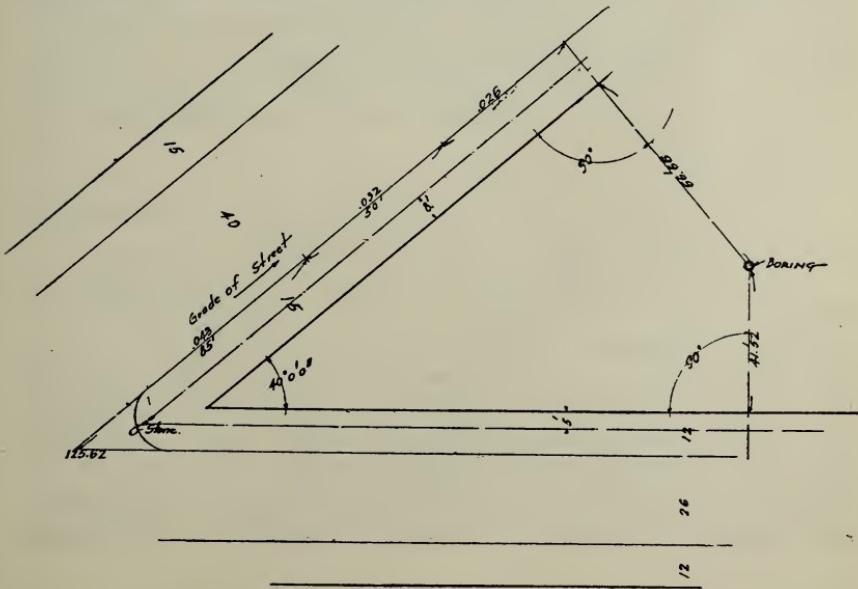


INSPECTOR OF TEST BORINGS (SEWAGE DISPOSAL), BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS, \$1,350 a year, November 8.

*Training and Experience—Weight 3.* See Questions 1 to 8, examination for Pipe Inspector, held January 6.

*Practical Questions—Weight 7.* 1. (*Credit=10%*). Describe the apparatus and method of making water jet borings. 2. ( $=10\%$ ). Describe the apparatus and method of making artesian well drilling borings. 3. ( $=10\%$ ). Describe briefly the

apparatus and method of making core borings by means of any of the usual machines. 4. ( $=10\%$ ). Describe the system you would adopt to take samples of coreborings, preserve them, and record the data obtained for a sewer 3 miles long. 5. ( $=10\%$ ). Wash borings are taken for a sewer in a glacial deposit. They indicate "hard" bottom uniformly about 6 feet below the surface. When the trench is opened no rock is encountered. What geological condition could produce this anomaly? 6. ( $=10\%$ ). Two samples of material are removed from an artesian well drilling boring. One is a fine powder, the other is composed of fragments as large as  $1/2$  inch. Which indicates hard rock and why? 7. ( $=10\%$ ). Using the attached print from a City plan, calculate the distances from the ranges to stake "A" for a boring, and determine the elevation of the curb at point "B" for a bench. 8. ( $=10\%$ ). Describe two methods for carrying a survey line past a building and also two methods for carrying the stations past the obstruction. 9. ( $=10\%$ ). Draw a profile of the surface of the ground along a sewer 500 feet long, show the sewer by two parallel lines and indicate by proper legend the results of core borings taken at 100-ft. intervals. 10. ( $=10\%$ ). You are assigned to take topography over a tract of 100 acres of rolling unwooded country. State the surveying instruments you would need, the number and positions of men for the corps, and how you would prepare the finished map.



**SPECIAL ELECTRICAL INSPECTOR, DEPARTMENT OF CITY TRANSPORT, \$5 a day, November 9.**

*Training and Experience—Weight 4.* See Questions 1 to 8, examination for Pipe Inspector, held January 6.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). The specifications on a job call for the installation of a 00 B. & S. gauge lead-sheaved cable. Give a brief description of how this cable should be made up and tell how to determine accurately whether it is the gauge called for. 2. ( $=10\%$ ). Name and explain two ways of connecting large cables. Which is the most effective and why? 3. ( $=10\%$ ). Give a brief description of the following: (a) Concentric strand cable; (b) duplex cable; (c) twin cable. 4. ( $=10\%$ ). Explain in detail how a lead-sheaved cable is installed in a conduit or duct. 5. ( $=10\%$ ). Where two or more large cables enter a splicing chamber, how is complete destruction due to the burn out of one prevented? Give two methods and explain each. 6. ( $=10\%$ ). Give the symbols found on a blueprint to represent: (a) Distribution panel; (b) main or feeder concealed under floor; (c) main or feeder run exposed; (d) junction or pull box. 7. ( $=10\%$ ). What is meant by the following terms in connection with a switchboard found in a plant containing two or more 220 volt direct current machines for parallel operation on 3 wire system: (a) Neutral bus; (b) equalizer bus; (c) balance coil leads? 8. ( $=10\%$ ). How is the K. W. load on a D. C. system determined from the switchboard? Explain how the instruments used are connected on the board. 9. ( $=10\%$ ). How is a telephone cable constructed? 10. ( $=10\%$ ). State in detail how a splice in a telephone cable should be made.

**INSPECTOR, BUREAU OF ELEVATOR INSPECTION, DEPARTMENT OF PUBLIC SAFETY, \$1,000 a year, November 9.**

*Training and Experience—Weight 4.* See examination for Elevator Inspector, March 20.

*Practical Questions—Weight 6.* 1. (*Credit=5%*). Concerning elevator cables: Name three points from which you would examine same to determine their wear. 2. ( $=5\%$ ). What is the object of using a hemp center in wire rope? 3. ( $=6\%$ ). What do you understand by a dynamic brake? 4. ( $=6\%$ ). On hand-power elevator, what should the maximum counterbalance be in excess of the weight of the car? 5. ( $=6\%$ ). Why are the

limit stops of a traction machine placed in the hatchway? 6. (=5%). Why is the counterbalance made lighter than the car on hydraulic elevators? 7. (=5%). Name and describe the principal kinds of cables used on elevators. 8. (=5%). Define the difference between automatic and semi-automatic gates. 9. (=6%). What advantage has the plunger elevator over other types of hydraulic elevators? 10. (=5%). If the shaftway of any passenger elevator is so located or the motive power is so limited in range as to make a basement air pit impracticable, where should the air pit be constructed? 11. (=6%). (a) Tell what are classed as electric passenger elevators. (b) Tell what are classed as hydraulic passenger elevators. 12. (=5%). What will stop the cables from unwinding in case the car should land on any object in hatchway? 13. (=6%). What should the minimum factor of safety be for a pressure tank? 14. (=5%). Describe types of hatchway, giving height, which will be approved by the Bureau for freight elevators. 15. (=6%). If the speed governor on a passenger elevator installation is set for safe maximum speed of 300 F. P. M. for elevator car, at what speed in excess of the above should this governor operate in event of the hoisting cables parting, or motor (if installation is electrically driven) losing its fields? 16. (=6%). Name five safety devices on an electric passenger elevator. 17. (=6%). From an elevator engineering standpoint, what would you consider the minimum factor of safety that should be used? 18. (=6%). In case of an accident to overhead sheaves, where same would break or fall apart, what would prevent the broken pieces from falling through and down the hatchway?

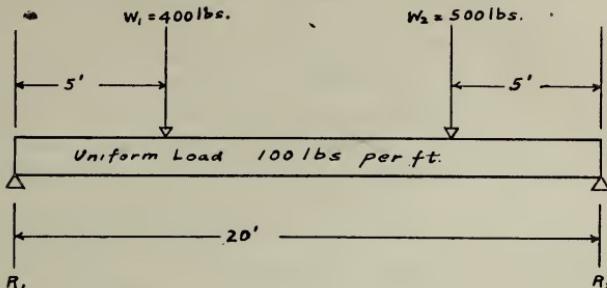
INSPECTING ENGINEER, DEPARTMENT OF CITY TRANSIT, \$1,800-\$2,000 a year, November 9.

*Training and Experience—Weight 3.* See Questions 1 to 8, examination for Pipe Inspector, held January 6.

*Practical Questions—Weight 5.* 1. (*Credit=15%*). What do you understand to be the requirements and duties of the position for which you are applying? 2. (=10%). (a) Under what conditions as to nearness and depth of excavation would you consider it necessary to underpin buildings adjoining excavation? (b) Give essential features of the process of underpinning a large building and precautions to be taken. (c) What are the requirements for concrete-filled steel piles used in an underpinning

operation? (d) What are the principal features to be carefully observed during the process of driving, and what records should be kept pertaining thereto? 3. ( $=15\%$ ). Write concise specifications for the following classes of work: (a) Excavation; (b) waterproofing; (c) concrete; (d) lumber; (e) steel. 4. ( $=15\%$ ). (a) Name the four principal causes of failure in reinforced concrete structures. (b) What resistance is offered by plain concrete to tensile and shearing stresses? (c) What are the fundamental principles of reinforced concrete design? (d) Describe the general structural principle of reinforced concrete beams. (e) In inspecting steel to be used in reinforced concrete construction, what are the essential points to be observed? (f) After the steel is placed, what are the points to be observed? (g) What is meant by the term "lap" as applied to reinforcing bars? Why is it important that the proper lap should be obtained in the placing of the bars? In what terms is the amount of lap usually stated? 5. ( $=5\%$ ). In timbering the sides of excavations: (a) Upon what does the pressure or thrust on a waling piece depend? (b) Give method of obtaining the size of waling pieces. (c) Give method of obtaining size of struts or braces. 6. ( $=5\%$ ). In making 12 cu. yds. of concrete, proportioned 1:2:4, how many bags of cement and cubic yards of sand and broken stone will be required, assuming the voids in sand 30% and in stone 40%, and a bag of cement to contain 0.9 cu. ft.? Show your calculation. 7. ( $=10\%$ ). State in their proper order the adjustments of the engineer's transit and level, and the purpose of each adjustment. 8. ( $=10\%$ ). (a) In what order do the following earths arrange themselves as to thrust, placing that with the least thrust first: moist earth, wet clay, compact gravel, dry sand, dry clay? (b) State several conditions that will disturb the amount of thrust of earth. (c) Give the safe bearing power per square foot of the following soils: Loam, clean sand, dry clay, compact gravel, wet clay. (d) What special precaution should be observed in placing sheathing against the sides of excavations? In subway construction operations: (e) What is done with water in the excavation below the elevation of adjacent sewers? (f) What is a sump? (g) When water is being pumped from the excavation, how would you determine if it is endangering adjacent buildings? (h) Sketch a transverse section between two bents of the timbering of an excavation for a subway 50 ft. wide and 20 ft. deep, showing the positions and dimensions of timbers required to support

the overhead street decking and sheathing of the sides. 9. ( $=10\%$ ). Simple beam supported at each end:



- (a) Compute the bending moment at the middle of the span (inch pounds). (b) Compute the shear at the right support and at the center of the span. 10. ( $=5\%$ ). (a) Which is the more economical: a retaining wall of gravity section or one built of reinforced concrete? State reasons why. (b) The height of a masonry retaining wall is 20 ft. above the level of the street; bearing soil is soft mud becoming stiffer as depth increases. Sketch proportionally the required section for this wall. No computations required.

*Oral Test—Weight 2.*

FIRE ESCAPE INSPECTOR, BUREAU OF POLICE, DEPARTMENT OF PUBLIC SAFETY, \$1,200 a year, November 9.

*Training and Experience—Weight 3.* See Questions 1 to 8, examination for Pipe Inspector, held January 6.

*Practical Questions—Weight 5.* 1. (*Credit=10%*). Give the requirements governing the area of openings onto a fire escape. 2. ( $=10\%$ ). How must a ladder from the second floor to the ground on an escape be hung? 3. ( $=10\%$ ). What are the requirements of the permanent ladders on fire escapes? 4. ( $=10\%$ ). What precautions must be taken of all approaches to fire escapes and why? 5. ( $=10\%$ ). In making an inspection of a fire escape which has been erected for some time, what principal features of the exterior work should be examined? 6. ( $=10\%$ ). How must the platform of an escape be built? 7. ( $=10\%$ ). How is the number of fire escapes required on a building determined? 8. ( $=10\%$ ). What action should the inspector take upon discovery of a violation of ordinance relative to fire escapes? 9. ( $=10\%$ ). What is a fire tower? Explain its general construction.

tion. 10. ( $=10\%$ ). Outline briefly the requirements governing lights, signals and notices, under the supervision of the Fire Marshal, in hotels, places of amusement, and other public buildings.

*Report Writing—Weight 2.* Write a report in the form of a letter to Hon. Robert M. Griffith, President of the Civil Service Commission, on "The Inspection of a Building." In this letter assume any irregular conditions you wish and give the remedy you would suggest for them. Sign this letter "*John Doe*."

MECHANICAL AND HYDRAULIC INSPECTOR, DEPARTMENT OF CITY TRANSIT, \$5.00 a day, November 10.

*Training and Experience—Weight 4.* See Questions 1 to 8, examination for Pipe Inspector, held January 6.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). Explain in detail how to line up a Worthington Duplex Elevator Pump. 2. ( $=10\%$ ). How is the valve motion on these pumps controlled and how are the valves set? 3. ( $=10\%$ ). Explain a method of reborning the steam cylinder of a pumping engine. 4. ( $=10\%$ ). Explain two kinds of pipe joints commonly used on large diameter steam mains. Which of these is the better and why? 5. ( $=10\%$ ). Explain or show by sketch the construction of a Cochran Feed Water Softener. 6. ( $=10\%$ ). Make a sketch showing the piping to and from a Cochran Feed Water Softener. In this sketch show the location of the various valves. 7. ( $=10\%$ ). Explain the operation of a hydraulic elevator system, giving the parts and purpose of each part of the system. 8. ( $=10\%$ ). Give a detailed description of a B. & W. boiler. 9. ( $=10\%$ ). In setting up a B. & W. boiler, give each step from the beginning until the boiler is ready for operation. 10. ( $=10\%$ ). State and explain in detail the necessary tests and inspection which should be made on a steam main before placing it into service.

HYDRANT INSPECTOR, BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$800 a year, November 10.

*Training and Experience—Weight 3.* See Questions 1 to 8, examination for Pipe Inspector, held January 6.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). Explain the construction of a fire hydrant? 2. ( $=10\%$ ). Name three common sources of trouble in fire hydrants. 3. ( $=10\%$ ). How are the troubles mentioned in Question #2 remedied? 4. ( $=10\%$ ). Name two causes of leaks in house piping. How are

these prevented? 5. ( $=10\%$ ). Explain how to detect the source of a leak which shows itself in the cellar of a property. 6. ( $=10\%$ ). What are some of the sources of water waste? How are these detected? 7. ( $=10\%$ ). A complaint is made by a property owner to the effect that the pressure of the water supply is so low that water cannot be obtained on the second floor. Explain how a complaint of this nature is investigated. 8. ( $=10\%$ ). What is a pressure gauge? How is it used? 9. ( $=10\%$ ). What valves are located between the main and the house line on a house service? How are each of these shut off? 10. ( $=10\%$ ). How much pressure in pounds per sq. in. would be necessary to force water to a height of 30 feet in a building, the pressure to be measured at the bottom of a straight vertical riser? Show how to determine this value.

*Report Writing—Weight 1.* Write a report of about 150 words in the form of a letter to Hon. William H. Kreider, Secretary, Civil Service Commission, on "The Advantages of Water Meters in Preventing Water Waste." Sign this report "*John Doe.*"

SMOKE INSPECTOR, BUREAU OF BOILER INSPECTION, DEPARTMENT OF PUBLIC SAFETY, \$1,200 a year, November 13.

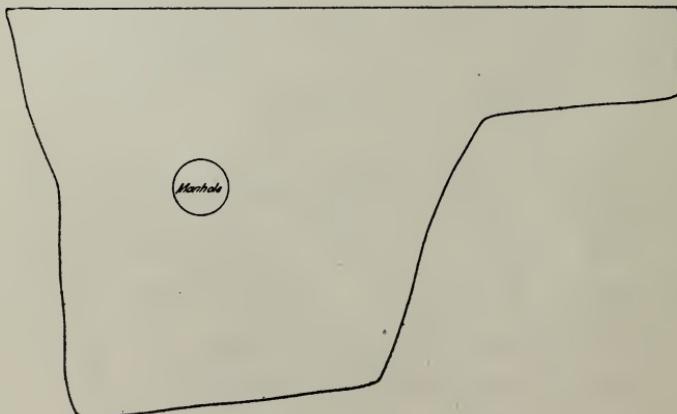
*Training and Experience—Weight 3.* See Questions 1 to 8, examination for Pipe Inspector, held January 6.

*Practical Questions—Weight 7.* 1. (*Credit=10%*). Give the smoke scale used in Philadelphia. 2. ( $=10\%$ ). Explain in detail the appliance used to measure the color of smoke. 3. ( $=10\%$ ). Explain thoroughly the method of using the appliance described in Question #2. Give the precautions which must be exercised in its use. 4. ( $=10\%$ ). Explain how a smoke complaint is investigated and disposed of. 5. ( $=10\%$ ). Name three common causes of smoke. 6. ( $=10\%$ ). A plant is burning soft coal under a Babcock & Wilcox boiler with hand-firing, using the spread system of firing and producing smoke. What recommendations would you suggest to the owner or responsible person in the plant? 7. ( $=10\%$ ). Name three methods of preventing smoke. 8. ( $=10\%$ ). Explain how to determine the cause of smoke in a plant. 9. ( $=10\%$ ). Name the essential parts of a boiler furnace and tell what each is for. 10. ( $=10\%$ ). What jurisdiction has the smoke inspector over locomotives in the City?

INSPECTOR (Engineering), BUREAU OF HIGHWAYS, DEPARTMENT OF PUBLIC WORKS, \$100 a month when employed, November 13.

*Training and Experience—Weight 3.* See Questions 1 to 8, examination for Pipe Inspector, held January 6.

*Practical Questions—Weight 7.* 1. (*Credit=10%*). Describe the sub-grading of a roadway for an asphalt pavement. 2. ( $=10\%$ ). State the method of proportioning, mixing, and placing the concrete base of a pavement. 3. ( $=10\%$ ). Assuming that the concrete base is completed, describe the construction of an asphalt pavement. 4. ( $=10\%$ ). What action should an inspector take when he discovers a footway in need of repairs? 5. ( $=10\%$ ). Explain how a granolithic footway pavement is constructed. 6. ( $=10\%$ ). Outline an efficient method of handling the City gangs on emergency repairs. 7. ( $=10\%$ ). A certain street is laid on a four degree curve. Compute its radius. 8. ( $=10\%$ ). A street drops 17.748 ft. in a distance of 373.65 ft. Compute the per cent of grade. 9. ( $=10\%$ ). Using a scale of 1 in. = 2 ft., show the method of measuring and the notes for the patch shown on the accompanying print. Compute its area in square yards and decimal. 10. ( $=10\%$ ). Write a report, of about 150 words to the Assistant Engineer, Second Highway District, in reply to a complaint of the Bureau of Fire on the worn-out and slippery condition of the wood block paving on Market Ave., between Pine St. and Oak St. The form, as well as the subject matter, will be considered in grading this report. Sign the report "John Doe."



## **MEDICAL SERVICE**

DRUGGIST, BUREAU OF HEALTH, FIRST ASSISTANT APOTHECARY, BUREAU OF CHARITIES, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$600 a year, January 12.

*Training and Experience—Weight 3.* 1. Give the names and addresses of two reputable citizens who will vouch for the truth of your answers on this paper. 2. What is your age? 3. (a) Give an outline of your general academic schooling. (b) What schools of Pharmacy did you attend, or where did you receive your training as a Druggist or Apothecary? (c) Are you a graduate in Pharmacy and when did you graduate? 4. Give a statement setting forth your employment as a Pharmacist, Apothecary or Druggist, giving names of your employers, length of time served, reasons for leaving and the character of the position in each case. 5. Give a statement of any further special training or experience that you have had which in your judgment qualifies you for this position. Are you a registered Pharmacist in Pennsylvania? If so, when were you registered?

*Practical Questions—Weight 7.* 1. (*Credit=10%*). Give maximum adult doses of the following: Atropine Sulphate; Tincture of Digitalis; Arsenic Trioxide; Physostigmine Sulphate; Tincture of Hyoscyamus; Veronal; Chloral Hydrate; Syrup of Squills; Fluid Extract of Ergot; Heroin Hydrochloride. 2. (*=10%*). Describe the process of making Elixir of Iron, Quinine and Strychnine. 3. (*=10%*). Give scientific names of the following: Fowler's Solution; Tully's Powder; Blaud's Pill; Dover's Powder; Brown Mixture. 4. (*=10%*). Define the following and give an example of each: Mixture, Glycerite; Oleate; Fluid Extract, Oleoresin. 5. (*=10%*). Describe the process of pill making. 6. (*=10%*). Define the different kinds of incompatibility and give an example of each. 7. (*=10%*). What criticism, if any, would you make of the following prescriptions:

R	Sodii Bicarbonatis		3 i p
	Ess. Pepsinæ	q. s. ad	1 3 ii
R	Tr. Ferri Chloridi		1 3 iii
	Spts. Ammonii Aromat.	q. s. ad.	1 3 ii

R	Strych. Sulph.	gr. i
	Potass. Iodid	3 ii
	Tr. Cimicifugæ	1 3 i
	Tr. Colchici Radicis	1 3 iii
	Syr. Aurantii Cort.	q. s. ad 1 3 iii

8. (=10%). Convert the last of the above prescriptions into terms of the metric system. 9. (=10%). What are the chemical antidotes for the following: Carbolic Acid, Morphine Sulphate, Arsenic, Acetic Acid, Silver Nitrate. 10. (=10%). From what plants are the following obtained and what part of the plant is used: Cocaine, Belladonna, Gelsemium, Spartein Sulphate, Strychnine, Aconite, Kino, Hamamelis, Gentian, Stramonium.

ASSISTANT, PATHOLOGICAL AND BACTERIOLOGICAL LABORATORY, BUREAU OF CHARITIES, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$720 a year, January 13.

*Training and Experience—Weight 3.* 1. What is your age? 2. What schools have you attended and what studies have you pursued? Give date of graduation, if graduated. 3. Give a statement of your experience in laboratory work, including places, names of employers, salaries received, length of service, kind of work, etc. 4. Give any other special information relating to your study of or experience that would tend to fit you for this position.

*Practical Questions—Weight 7.* 1. (*Credit*=40%). Give the technique of the Wassermann test. 2. (=15%). Describe the method of treatment of a section of the spinal cord sent to the laboratory for examination. 3. (=15%). Describe technique of sputum examination for tuberculosis. 4. (=15%). Describe the blood picture of malaria. 5. (=15%). Describe swab-findings in follicular tonsilitis, non-diphtheritic. NOTE:—A practical test will be held in connection with this examination at the laboratories of the Philadelphia Hospital for Contagious Diseases on January 21, 1916, at 10 A. M.

CITY NURSE, BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$900 a year, January 17.

*Training and Experience—Weight 3.* 1. Give your present address. 2. Where were you born? 3. What is your age? 4. How long have you resided in Philadelphia? 5. Where did you attend preparatory school or college? 6. Give date of gradu-

tion. 7. Give date of entrance and date of graduation and name of hospital training school from which you graduated and received your diploma as a fully qualified nurse. 8. Have you a license or certificate of registration from the State Board of Examiners authorizing you to practice nursing in the State of Pennsylvania? 9. Give date of your registration. 10. If not registered in the State of Pennsylvania, is it your intention to immediately take steps to do so? 11. Following your graduation from a Nurses' Training School, state the positions you have filled as Nurse, Assistant Head Nurse, Head Nurse, Superintendent of Nurses, giving names of Hospitals or Institutions in which you have served, together with period of service. 12. Have you had experience in nursing or caring of infants and children? 13. Have you had experience in Social Service Work? Where and in what capacity, and give period of service? 14. Have you had experience in hospital or private practice in nursing cases of contagious diseases? 15. What is your present occupation? 16. Have you any other occupation or profession? If so, state same. 17. Have you ever been engaged in any capacity which in your opinion particularly fits you for the position of Municipal Nurse? 18. Are you in good physical condition and capable of undertaking and performing the active and exacting routine duties of a Municipal Nurse? 19. Give six (6) names and addresses for reference, three (3) of which should be physicians.

*Technical Knowledge—Weight 3.* 1. (*Credit=12%*). Name the contagious diseases which should be reported. Name some of the important symptoms that would cause you to report to the Bureau of Health as "Suspicious Cases" in need of medical attention, and which should be isolated. 2. (*=13%*). Describe in detail your suggestions as to method of field work of a Municipal Visiting Nurse. 3. (*=12%*). Name in order of importance the information to be obtained for a complete record covering a pre-natal case, found under insanitary conditions in a congested neighborhood, and what personal care, instruction, etc., would you give such a case? 4. (*=12%*). Describe routine care of a baby three (3) days old, and what instructions would you give the mother? 5. (*=13%*). In what manner should a Municipal Visiting Nurse co-operate with the physician, hospital, dispensary and welfare agencies? Name some of the agencies with whom the Municipal Visiting Nurse should co-operate. 6. (*=12%*). What do you consider should be the special personal

qualifications of a Municipal Visiting Nurse? 7. (=13%). Give two (2) causes of high mortality among infants. 8. (=13%). What procedure would you follow in a case with incipient tuberculosis who refuses to give up work and go to a sanitarium for the reason that his wife and children would be without support?

*Judgment, Tact and Personality (Oral)*—Weight 4. This subject will be graded in an oral interview.

RESIDENT PHYSICIAN, BUREAUS OF HEALTH AND CHARITIES, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$600-\$900 a year, January 18.

*Training and Experience*—Weight 3. Give the names and addresses of two reputable citizens who will vouch for the truth of your answers on this paper. 2. What is your age? 3. What college or medical school have you attended and what degree have you received? Give date of graduation. 4. When and where were you licensed to practice? 5. Has your practice of medicine been continuous since you were licensed? If not, give details of your other work (nature, dates, salaries, etc.). 6. What has been the extent of your hospital experience? 7. Have you specialized in any branch of medicine or surgery? If so, give details.

*Practical Questions*—Weight 7. 1. (*Credit*=10%). Differentiate aortic stenosis and aortic regurgitation. 2. (=10%). Give the composition of human and cow's milk. 3. (=10%). Give a brief description of the anatomy of the kidney. 4. (=10%). Describe the digestion of a meal of beefsteak and potatoes. 5. (=10%). Give the dose, physiological action and therapeutic uses of apomorphine hydrochloride. 6. (=10%). Describe the symptoms and ordinary course of a case of typhoid fever, and give diagnosis of two of the principal complications. 7. (=10%). Give diagnosis and treatment of Colles' fracture. 8. (=10%). Give the symptoms of a lesion of the anterior horns of gray matter of the spinal cord. 9. (=10%). Give diagnosis and treatment of a case of scabies. 10. (=10%). Write a prescription containing at least two ingredients for a case of acute bronchitis.

INTERNE, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, Salary, none, February 4.

*Technical Knowledge*—Weight 6. NOTE:—Begin the answer to each question on a *separate* sheet. 1. (*Credit*=10%). Tell briefly the difference between partial and complete heart block.

2. ( $=10\%$ ). (a) What acute conditions does pneumonia in children at the onset often simulate? (b) Tell briefly when you would use a cardiac stimulant in croupous pneumonia, and when in secondary broncho-pneumonia in children, and why? (c) If limited to one cardiac stimulant in these conditions, what would you choose? (d) Is the fresh air treatment equally desirable in both types of pneumonia in children? Give reasons briefly.
3. ( $=10\%$ ). Give the treatment of a comminuted fracture involving all three (3) bones at the elbow joint, caused by a crushing force, but without external wound. 4. ( $=10\%$ ). Give the differential diagnosis and treatment of an abscess of the right kidney. 5. ( $=10\%$ ). (a) Give symptoms, diagnosis and treatment of vulvo-vaginitis in infants. (b) What prophylactic measures should be taken to prevent this disease among children in the home, hospital and institution? 6. ( $=10\%$ ). Give the symptomatology and treatment of typhoid fever. 7. ( $=10\%$ ). Name the diseases due to or influenced by occupation and environment. Briefly outline procedure and methods that might prevent same. 8. ( $=10\%$ ). Enumerate according to their frequency, the most important causes of foetal deaths, and state the causes of foetal deaths which can be most effectively reduced by prenatal care. 9. ( $=10\%$ ). Give in detail the preparation for and management of a case of normal labor. 10. ( $=10\%$ ). Give etiology, pathology, symptomatology, differential diagnosis and treatment of locomotor ataxia.

*Personal Fitness, Tact, Judgment (Oral)—Weight 4.*

CHIEF, DENTAL DISPENSARY, BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$2,500 a year, March 2.

*Training and Experience—Weight 2.* 1. For what position do you apply? 2. Give the day, month and year of your birth. 3. With respect to your general and professional education, state fully names of schools and colleges you have attended and courses of study in each. 4. How long have you practiced your profession? Give the positions or offices in which you have worked. 5. State any additional facts, not covered by the foregoing questions, which might show your fitness for the position for which you apply.

*Technical Knowledge—Weight 5.* 1. (*Credit=8%*). What disease conditions may result from an unhygienic mouth? (a) Locally and (b) systemically? 2. ( $=6\%$ ). Describe in detail

the prophylactic treatment of an unhygienic mouth. 3. ( $=10\%$ ). Under the public service conditions presented by the Municipal Dental Clinic, what considerations would determine your method of dealing with the problems presented by caries of the first permanent molar in the several stages of the carious process? 4. ( $=7\%$ ). What systemic and remote local derangements may result from sub-acute periapical infections? 5. ( $=6\%$ ). What nervous disturbances may result from abnormal dentition? 6. ( $=3\%$ ). Describe the dental hypoplasia known as the "Hutchinson" tooth. To what extent is it pathognomonic of syphilis, and what other stigmata in connection therewith would tend to confirm a diagnosis of hereditary syphilis? 7. ( $=10\%$ ). Given the case of a permanent lower first molar with exposed and aching pulp in a child twelve years of age, describe in detail your treatment of the case from start to finish. 8. ( $=5\%$ ). What circumstances would guide you in the selection of filling materials for use in the teeth of children? 9. ( $=7\%$ ). Give the cause and treatment of apical abscess: (a) Acute and (b) chronic, with and without fistulous outlet on the gum. 10. ( $=7\%$ ). Give the mode of administration of nitrous oxide as a general anesthetic. Describe the several stages of its action, and how you would determine the stage of complete necrosis. 11. ( $=7\%$ ). Give the technique and state what precautions are to be observed in inducing local anesthesia by cocaine and novocain, respectively, and what are the dosage and relative safety of each? 12. ( $=6\%$ ). What methods would you employ to arrest persistent hemorrhage after tooth extraction? 13. ( $=4\%$ ). (a) What kinds of fractures occur in the mandible and what are the common points of fracture? (b) What two splints are considered best? 14. ( $=4\%$ ). What are the characteristic lesions and deformities associated with mouth breathing? 15. ( $=10\%$ ). What is the general scope of usefulness to the community of a dental free clinic, and how can the objects of its service be most broadly and efficiently attained?

*Personal Fitness, Tact and Judgment (Oral)—Weight 3.* This subject will be graded in an oral interview.

ANESTHETIST (Men and Women), BUREAU OF CHARITIES, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$900 a year, March 3.

*Training and Experience—Weight 3.* 1. Give the names and

addresses of two physicians for whom you have given anesthetics. 2. What is your age? 3. What training school have you attended? Give date of graduation. 4. How long have you been giving anesthetics, and about how often have you given them? 5. What anesthetics have you administered? 6. Where has most of your work been done?

*Technical Questions—Weight 7.* 1. (*Credit=25%*). What may cause serious cyanosis during and after the administration of an anesthetic? 2. ( $=20\%$ ). What may be looked upon as contra-indications to the administration of ether, of gas, and of chloroform? 3. ( $=15\%$ ). What symptoms would suggest the discontinuance of an anesthetic? 4. ( $=20\%$ ). What would indicate too profound anesthesia; too light an anesthesia? 5. ( $=20\%$ ). What would you do for arrest of respiration during anesthesia?

RESIDENT PHYSICIAN (Men), BUREAUS OF HEALTH AND CHARITIES, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$600-\$900 a year, March 3.

*Training and Experience—Weight 3.* See examination for Resident Physician, held January 18.

*Practical Questions—Weight 7.* 1. (*Credit=10%*). Give the pathology and pathogenesis of paresis, taking into consideration particularly the role played by the treponema in its causation and how this would modify the treatment of the case. 2. ( $=10\%$ ). Give the classification of the insanities of adolescence, indicating the prognosis of each. 3. ( $=10\%$ ). What are the indications in the treatment of the insane for the continuous baths? How long and how often should they be used? 4. ( $=10\%$ ). Given a ward of twenty cases of acute mental disease, how would you organize the nursing and care of such a ward, with particular reference to the nursing, the medical attention, the prevention of accidents, etc.? 5. ( $=10\%$ ). What would be your attitude towards the use of mechanical restraint? Under what conditions would you use it if you decided that it was advisable? How would you account for control of extremely violent maniacal cases? 6. ( $=10\%$ ). What particular care should be exercised as to nursing attention in acute depressive conditions? 7. ( $=10\%$ ). Give your ideas as to occupation as a therapeutic agent in the convalescence of mental disease, type of cases to which it would be applicable and the best methods for carrying

it out in (a) wards of an institution; (b) outside of it. 8. (=10%). How does a previous long-continued history of alcoholism affect the prognosis and treatment in mental disease, occurring (a) in early to middle life; (b) in late life? 9. (=10%). Give some of the factors in the production of idiocy and the conditions that may precipitate insanity in the medium to high grade imbecile. 10. (=10%). Give a short classification of mental disease and indicate in the care of the insane the best method of treatment and the different groups, with particular reference to what types of cases could be grouped together, and the proper treatment of the cases.

#### NON-COMPETITIVE EXAMINATION.

MEDICAL DIRECTOR, CIVIL SERVICE COMMISSION, \$1,800 a year, March 13.

*Experience—Weight 4.* 1. Submit a complete statement of your general education and training. Give the names of the institutions at which you have studied, the length of attendance (with dates) in each case, and the degree (if any) conferred. 2. Submit a complete statement of your business or professional training and experience, giving the names and addresses of your employers, with dates, the exact nature of your duties with each, salaries received, and reasons for making any change. 3. Submit also a statement of any special training you have had, and a list of the books you have read along the lines that would tend to fit you for this position.

*Thesis—Weight 4.* Discuss in a thesis of about 1,000 words the importance as well as the scope of the medical and physical examinations of candidates by the Civil Service Commission, and outline a plan by which accurate results may be obtained and recorded.

*Personal Fitness (Oral)—Weight 2.*

OUTDOOR PHYSICIAN, BUREAU OF CHARITIES, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$540 a year, March 23.

*Training and Experience—Weight 3.* See examination for Resident Physician, held January 18.

*Practical Questions—Weight 7.* 1. (*Credit=10%*). What would be your treatment if called to see a case of carbolic acid poisoning? What signs would you look for to substantiate the diagnosis? 2. (=10%). Give the main varieties of pneumonia,

the physical signs, and treatment of one variety. 3. (=10%). What are the cardinal symptoms of appendicitis? 4. (=10%). Given a patient with coma, how would you differentiate uremia, alcoholism, cerebral apoplexy and diabetes? 5. (=10%). State signs of dislocation of elbow. 6. (=10%). Given a case of laryngeal diphtheria, what procedure would you follow out? 7. (=10%). Give symptoms and treatment of la grippe. 8. (=10%). How would you treat a case of enteritis in a child one year of age? 9. (=10%). How would you manage a case of breech presentation if called in during the second stage of labor? 10. (=10%). What would be your treatment of shock?

ASSISTANT BACTERIOLOGIST (Men), BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$1,400-\$1,500 (Inc.) a year, April 28.

*Training and Experience—Weight 4.* For Questions 1, 2, 3 and 5, see Questions 1, 2, 3 and 5, examination for Resident Physician, held January 18. 4. What is your profession or occupation? Give a general resume of your experience. 6. Give in detail the extent and character of your experience in bacteriological work.

*Practical Questions—Weight 6.* 1. (*Credit=15%*). Describe the prophylactic administration of typhoid vaccine. What is the duration of the immunity? 2. (=15%). How would you recognize the different types of the pneumococcus? 3. (=15%). Give the preparation of sensitized bacterins. 4. (=15%). Outline the isolation of typhoid bacilli from the feces. 5. (=15%). Give the different types of diphtheria bacilli (morphologically) regarding their virulence. 6. (=10%). What culture media would you recommend for the cultivation of (a) *B. tuberculosis*; (b) *B. influenzae*; (c) pneumococci? 7. (=15%). How would you make a positive diagnosis of a case of epidemic cerebro-spinal meningitis?

FIRST ASSISTANT BACTERIOLOGIST (Men) (Promotion), BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$2,000 a.year, April 28.

*Training and Experience—Weight 5.* For Questions 1, 2, 3 and 5, see Questions 1, 2, 3 and 5, examination for Resident Physician, held January 18. 4. What is your profession or occupation? Give a general resume of your experience. 6. Give in

detail the extent and character of your experience in bacteriological work.

*Practical Questions—Weight 5.* 1. (*Credit=15%*). State the differences in Wassermann technic with cerebro-spinal fluid and blood serum. 2. (=10%). Describe the Schick reaction. 3. (=15%). Give the preparation of cholesterolized antigen. 4. (=15%). Give the preparation of sensitized bacterins. 5. (=15%). Describe a simple test for iso-hemolysins and iso-hemagglutinins. 6. (=15%). Briefly detail the quantitative estimation of *B. coli* from water by lactose bile method. 7. (=15%). Give technic for the fixation, embedding and staining by ordinary laboratory methods of a mass from a cancer.

FOURTH ASSISTANT BACTERIOLOGIST (Men), BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$1,000 a year, April 28.

*Training and Experience—Weight 3.* For Questions 1, 2, 3 and 5, see Questions 1, 2, 3 and 5, examination for Resident Physician, held January 18. 4. What is your profession or occupation? Give a general resume of your experience. 6. Give in detail the extent and character of your experience in bacteriological work.

*Practical Questions—Weight 7.* 1. (*Credit=15%*). Describe the prophylactic administration of typhoid vaccine. What is the duration of the immunity? 2. (=15%). How would you recognize the different types of the pneumococcus? 3. (=15%). Give the preparation of sensitized bacterins. 4. (=15%). Outline the isolation of typhoid bacilli from the feces. 5. (=15%). Give the different types of diphtheria bacilli (morphologically) regarding their virulence. 6. (=10%). What culture media would you recommend for the cultivation of (a) *B. tuberculosis*; (b) *B. influenzae*; (c) pneumococci? 7. (=15%). How would you make a positive diagnosis of a case of epidemic cerebro-spinal meningitis?

CHIEF, DENTAL DISPENSARY, BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$2,500 a year, October 23.

*Training and Experience—Weight 3.* See examination for Chief, Dental Dispensary, held March 2.

*Practical Questions—Weight 3.* 1. How may a permanent tooth be distinguished from a temporary one? Which permanent and

which temporary teeth are usually in the dental arch at 7 years, at 10 years, at 12 years of age, respectively? By which permanent tooth is each temporary tooth succeeded? 2. About how long before the shedding of temporary teeth does the resorption of their roots begin, and by what agency is the resorption produced? What considerations govern the treatment of roots of temporary teeth in case of pulp exposure or pulp death and how may the difficulties be met? 3. At what age is the root of a permanent fifth molar completely developed? If the pulp is exposed before such development, what is the treatment? (In detail.) If exposed after such development, what is the treatment? 4. What ill results may accrue from too early extraction or too long retention of temporary teeth? If at 14 and 18 years of age a permanent cuspid has not erupted, what considerations would affect your judgment in the case? 5. What effect have dental diseases and lack of hygiene upon the mouth and general system? What effect upon mentality and general efficiency? 6. What benefits result from the regular practice of oral prophylaxis? What means are employed for the purpose? 7. Name the general anaesthetics most frequently employed in dental practice. Which would you prefer, and why? State your experience from practical administration of same. 8. (a) What cases would specially indicate the use of a local anaesthetic? (b) Write a prescription for a local anaesthetic such as you would employ. (c) What results would be obtained? 9. What dangerous conditions are sometimes associated with the administration of an anaesthetic? What restorative would you use in such cases? 10. Before deciding upon extracting, what general condition should be considered? Do you deem it advisable to explain to a child what you propose doing? If so, why? If not, why? 11. By what means may persistent local hemorrhage after extraction be checked? If secondary hemorrhage should occur, give your method of controlling it. 12. What filling materials should ordinarily be used in children's teeth, and how should they be used—singly or in combination? What circumstances determine your choice? 13. State the advantages resulting from conservation of the dental pulp. 14. What medicaments may safely be used to reduce sensitivity of dentin?

*Thesis—Weight 2.* Write a thesis of about 1,000 words on the following subject: "What are the objects of a free dental clinic?"

Give your method of conducting a clinic so as to secure these objects.

*Dispensary Test—Weight 2.*

ASSISTANT DENTIST, BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$700 a year, October 23.

*Training and Experience—Weight 2.* See examination for Chief, Dental Dispensary, held March 2.

*Practical Questions—Weight 4.* 1. Give number and names of teeth in deciduous set. In permanent set. What is the first tooth of the permanent set to erupt? Why is it sometimes mistaken for a deciduous tooth? 2. At what age usually should the last deciduous tooth be shed? Name in regular order, according to age, the permanent teeth that succeed the deciduous ones. 3. What anatomical and physiological differences make pathological first dentition ordinarily differ from pathological second dentition? What reflex disturbances may be produced by abnormal second dentition? 4. Name the relation of the upper teeth to the lower (permanent) when in normal occlusion. What ill results follow mal-occlusion and what corrective methods should be employed? 5. How would you determine whether a tooth contained a living or a devitalized pulp? How would you treat a freshly exposed living pulp in a deciduous tooth (describe two methods)? 6. Give technique of pulp devitalization by arsenous acid. What would be your treatment of arsenical necrosis should it supervene? Name several other methods of pulp devitalization. 7. May novocain be safely administered as a local anaesthetic? With what other drug is it usually combined, and why? Why is it regarded as safer than cocaine? What is meant by conductive anesthesia? 8. In what two ways may nitrous oxide and oxygen be administered to assure painless dental operations? What symptoms characterize each method? 9. Give several methods of arresting post-extraction hemorrhage. Which method may be relied upon when others have failed? 10. Describe method of handling a child presenting for extraction so as to overcome fear and obtain the best results. 11. How may an unhygienic mouth be put in healthy condition and how may it be kept so?

*Dispensary Test—Weight 4.*

PHYSICIAN (PHILADELPHIA HOME FOR INDIGENTS), BUREAU OF CHARITIES, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$720 a year.

SECOND ASSISTANT RESIDENT PHYSICIAN (P. H. C. D.), BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$800 a year, November 11.

*Training and Experience—Weight 3.* See examination for Resident Physician, held January 18.

*Practical Questions—Weight 7.* 1. (*Credit=10%*). Describe the two main varieties of pneumonia and treatment of one variety. 2. (*=10%*). What eruptions resemble the eruption of scarlatina and what differences would aid in arriving at a correct diagnosis? 3. (*=10%*). Give symptoms and treatment of a dislocated hip. 4. (*=10%*). When and how often should a person be vaccinated? 5. (*=10%*). Symptoms and treatment of acute articular rheumatism. 6. (*=10%*). Describe the preparation of a "throat culture." In what cases should such culture be made and what are the sources of error? 7. (*=10%*). Symptoms and treatment of acute nephritis. 8. (*=10%*). Describe the technique of lumbar puncture. 9. (*=10%*). Give the technique of blood examinations useful in the diagnosis of infectious diseases. 10. (*=10%*). Diagnosis and treatment of laryngeal diphtheria.

ASSISTANT OPHTHALMOLOGIST, BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$1,200 a year, November 14.

*Training and Experience—Weight 3.* See examination for Resident Physician, held January 18.

*Practical Questions—Weight 7.* 1. (*Credit=10%*). What is retinoscopy? Give a brief description of method of using it. 2. (*=10%*). What forms of cataract would you find in school children, and how would you differentiate between them? 3. (*=10%*). What are the causes of opacity of the cornea? 4. (*=10%*). Describe sympathetic ophthalmia. 5. (*=10%*). Name diseases of the conjunctiva that are infectious. 6. (*=10%*). Describe the different forms of squint and how you would correct them. 7. (*=10%*). Give a description of trachoma and its treatment. 8. (*=10%*). What is anisometropia? 9. (*=10%*). Describe mydriasis and its causes. 10. (*=10%*). How would you neutralize and center a lens?

HEAD NURSE (PHILADELPHIA HOSPITAL FOR CONTAGIOUS DISEASES AND DIPHTHERIA HOSPITAL), BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$900 a year, November 14.

*Training and Experience—Weight 4.* 1. Give the names and

addresses of two reputable citizens who will vouch for the truth of your answers on this paper. 2. What is your age? 3. What has been the extent of your general education (Grammar School, High School and College)? Give the names and location of the schools, dates of entering and dates of graduation or leaving. Did you complete the courses? If not, why not? 4. Where and when did you receive your training in nursing? Have you been regularly employed as a nurse since your graduation? If not, why not? 5. Are you a registered nurse in Pennsylvania? 6. What has been the extent of your hospital experience? 7. Have you ever held any other position except as nurse? If so, give details. 8. Have you specialized in one particular kind of nursing? If so, what? 9. Give the names and addresses of five doctors for whom you have worked and whom you would be willing to have consulted as references?

*Practical Questions—Weight 6.* 1. (*Credit=10%*). Describe in a general way the hospital treatment of a case of tonsillar diphtheria from a nurse's point of view. 2. (*=10%*). How would you prepare for administration of diphtheria antitoxin? 3. (*=10%*). Describe the nurse's role in intubation with regard to (a) Time previous to presence of physician; (b) during operation; (c) after-care. 4. (*=10%*). During treatment of a case of scarlet fever, what usual complications and sequelae are especially looked for? 5. (*=10%*). Give average doses of the following drugs: (a) Strychnine sulphate; (b) potassium citrate; (c) tincture digitalis; (d) atropine sulphate; (e) caffeine citrate. 6. (*=10%*). Describe treatment of a bedsores regarding prophylaxes and active treatment. 7. (*=10%*). In asphyxia not properly remedied by intubation, what procedure would you next expect and how would you prepare for same rapidly? 8. (*=10%*). Describe a method of giving medicine by inhalation. 9. (*=10%*). Describe preparation of patient for ward after admittance to hospital. 10. (*=10%*). Give antidotes for (a) Carbolic acid; (b) bichloride of mercury; (c) iodine.

FIRST ASSISTANT RESIDENT PHYSICIAN (P. H. C. D.) (Men), BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$1,200 a year, November 14.

*Training and Experience—Weight 4.* See examination for Resident Physician, held January 18.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). What are the complications of (a) Diphtheria; (b) scarlet fever? 2.

(=10%). What precautionary measures should be taken to prevent mixed infection in the wards of the Philadelphia Hospital for Contagious Diseases? 3. (=10%). Outline diet for (a) A child of five years during acute period of diphtheria; (b) a child of same age convalescing from same disease; (c) a child of one year convalescing from same disease. 4. (=10%). When would you consider a case of diphtheria cured and free from infection? 5. (=10%). Diagnose a case of anterior poliomyelitis and discuss treatment. 6. (=10%). Differential diagnosis between chicken-pox and small pox. 7. (=10%). Differential diagnosis between diphtheria and Vincent's angina. 8. (=10%). Diagnosis and treatment of anthrax. 9. (=10%). Describe the occasional sequels of diphtheria antitoxin injections. 10. (=10%). Describe technic of intubation and failing to relieve asphyxiation satisfactorily. Describe next method to pursue.

ASSISTANT MEDICAL INSPECTOR, BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$1,400 a year, November 14.

*Training and Experience—Weight 3.* For Questions 1 to 7, see examination for Resident Physician, held January 18. 8. What additional specific experience, if any, have you had which would tend to qualify you for this particular position?

*Practical Questions—Weight 7.* 1. (*Credit*=10%). When and how often should an individual be vaccinated? 2. (=10%). How would you make a differential diagnosis between chicken-pox and smallpox? 3. (=10%). How would you make a differential diagnosis between German measles and scarlet fever? 4. (=10%). How would you diagnose measles and what technique would you employ in order to make the earliest possible diagnosis? 5. (=10%). How would you make a diagnosis of acute poliomyelitis: (a) In a child; (b) in an adult? 6. (=10%). How would you disinfect a room and the clothing therein which had been occupied by an infectious disease? 7. (=10%). Supposing a case of typhoid fever occurred on the premises where a milk business or bakery was conducted, what instructions would you give to the householder? 8. (=10%). How would you determine when a case of diphtheria is terminated? 9. (=10%). What would you consider a preventive dose and a curative dose of diphtheria antitoxin? 10. (=10%). What do you consider the best method of immunization in typhoid fever and describe the technique.

ASSISTANT MEDICAL INSPECTOR OF PUBLIC SCHOOLS, BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$600 a year, November 22.

*Training and Experience—Weight 3.* See examination for Resident Physician, held January 18.

*Practical Questions—Weight 7.* 1. (*Credit=10%*). What symptoms and physical signs would lead you to diagnose adenoids in a child under your inspection? 2. (*=10%*). When would you permit the return to school of a child excluded for pediculosis? 3. (*=10%*). Describe trachoma. 4. (*=10%*). What are the evidences of eyestrain in a child of eight years? 5. (*=10%*). What precautionary measures should be taken by the teacher in a case of a child with running ear? 6. (*=10%*). Give the signs and symptoms of measles. 7. (*=10%*). Differentiate the onset of measles from that of scarlet fever. 8. (*=10%*). What symptoms would lead you to suspect whooping cough in a child? 9. (*=10%*). What is the appearance of scabies and parts of body most affected? 10. (*=10%*). Describe tinea circumata.

DISTRICT SURGEON, BUREAU OF POLICE, DEPARTMENT OF PUBLIC SAFETY, Fees, November 22.

*Training and Experience—Weight 3.* See examination for Resident Physician, held January 18.

*Practical Questions—Weight 7.* 1. (*Credit=10%*). Give differential diagnosis between coma, opium poisoning, uremia, diabetes, hysteria and compression of the brain. 2. (*=10%*). How would you diagnose fracture of the base of the skull? 3. (*=10%*). How would you treat asphyxiation from smoke; from smoke impregnated with fumes of ammonia; smoke impregnated with fumes of nitric acid? 4. (*=10%*). What is the chief danger from inhalation of smoke impregnated with fumes of ammonia or a mineral acid? 5. (*=10%*). Give differential diagnosis between acute appendicitis and stone in the ureter. 6. (*=10%*). Define paranoia and give symptoms. 7. (*=10%*). What is statutory rape, incest, sodomy, fornication, adultery? 8. (*=10%*). What first-aid method would you use in treating a fracture of the femur? 9. (*=10%*). Classify burns and give treatment. 10. (*=10%*). A person is bitten by a supposedly rabid animal. What instructions would you give concerning the animal and what instructions would you give the person bitten?

# **SUPERVISING SERVICE**

**SUPERINTENDENT OF FILTERS (PROMOTION), BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$1,500 a year, August 7.**

*Training and Experience—Weight 3.* Any false statement made by the applicant in answering these questions will be regarded as good cause for excluding him from the eligible list or for removal or discharge during probation or thereafter.

1. What is your age?....years....months.

2. Did you attend Grammar School? (Yes or no.) If so, fill in the following: (a) Date of entrance; (b) date of graduation or leaving; (c) reason for leaving; (d) if you were not graduated, state the grade you were in when you left.

3. Did you attend a High School? (Yes or no.) If you answer yes, fill in the following: (a) Name of school; (b) course pursued; (c) date of entrance; (d) date of graduation or leaving; (e) reason for leaving; (f) if you were not graduated, state the class you were in when you left.

4. Did you attend a Technical School? (Yes or no.) If so, fill in the following: (a) Name of school; (b) course pursued; (c) date of entrance; (d) date of graduation or leaving; (e) reason for leaving; (f) if you were not graduated, state the class you were in when you left.

5. Did you attend any evening schools? (Yes or no.) If so, fill in the following: (a) Names of schools; (b) courses pursued at each school; (c) date of entrance; (d) date of graduation or leaving; (e) what was your daily occupation while attending evening school?

6. (a) What is your trade or occupation? (b) What training did you receive for it? All dates must be given. (c) How long have you followed it?....years....months.

7. How long did you serve as a filter attendant?....years....months. Give name of plant, dates of entering and leaving, and reason for leaving.

8. How long have you been a foreman in the Bureau of Water?....years....months. Give dates of entering and leaving, and reason for leaving.

9. Have you any supervising or executive experience? (Yes or no.) If so, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position.

10. Give details asked in the ninth question concerning any other positions you have held.

11. Give the names and addresses of your employers whom you would be willing to have consulted as references.

*Practical Questions—Weight 4. 1. (Credit=10%). Outline*

the organization required to operate a complete filter plant. State the duties of each position. 2. ( $=10\%$ ). (a) Give a brief description of the construction of a pre-filter. (b) Describe the course of the water through this filter. 3. ( $=10\%$ ). Describe two methods of cleaning pre-filters. 4. ( $=10\%$ ). (a) Is the presence of lime in filter sands objectionable? (b) Why? (c) How is it detected? 5. ( $=10\%$ ). What factors should be considered in the selection of a filter sand? 6. ( $=10\%$ ). (a) Describe briefly the construction of a final sand filter. (b) What is usually considered the minimum depth of sand for efficient filtration? 7. ( $=10\%$ ). How can you determine when a filter should be cleaned? 8. ( $=10\%$ ). Describe, in detail, two methods of cleaning final filters, stating the advantages of each method. 9. ( $=10\%$ ). (a) Define turbidity. (b) How is it measured? 10. ( $=10\%$ ). Show a sample weekly report on the operation and costs of a filter plant.

*Personal Fitness (Oral)—Weight 3.*

ASSISTANT FOREMAN, BUREAU OF HIGHWAYS, DEPARTMENT OF PUBLIC WORKS, \$3 a day, November 20.

*Experience—Weight 3.* 1. What is your age? 2. Give the names and locations of the schools (Grammar, High, College or Technical) which you attended, the courses you took in each case and the date of your graduation. If you did not graduate, how far did you go? 3. What is your occupation, trade or profession? How long have you followed it? What training have you had for it? 4. What has been your practical experience as a Superintendent, Foreman, Assistant Foreman, or any other capacity requiring supervision of a number of men? Give names and addresses of your employers, character of their business, length and dates of your employments, duties of your position, salary received and reason for leaving in each case. Give these in order of time with your present position last. 5. What positions, other than those of a supervisory nature, have you held? Give details as in question No. 4. 6. If you have been in business for yourself, state the nature of the business, when and how long you were in business, and your average yearly income. NOTE:—The answers to Questions 4 and 5 should give an outline of all the experience which the applicant has had since leaving school along the lines of the positions for which he is applying, given in detail and with dates.

*Practical Questions (Oral)—Weight 5.* 1. How should a macadam road containing several large depressions, caused by a sinking of the subgrade, be repaired? 2. (a) What is a scarifier? (b) When should it be used? 3. Describe the process of surface treatment of macadamized roads. 4. (a) What proportions are used in the concrete for the base of street paving? (b) How is it mixed and laid? 5. How are repairs made in a vitrified brick pavement?

*Arithmetic—Weight 2.* 1. (*Credit=20%*). A grade stake is marked "Cut 2.6." The pavement is 9" thick. How far would you dig below the top of the stake? 2. (*=20%*). How many gallons of tar are required to cover a road 18 ft. wide and 350 ft. long, using  $\frac{1}{2}$  gal. per sq. yd.? 3. (*=20%*). How many teams and laborers are required to unload 2 cars, each containing 50 tons of broken stone, and haul it 2 miles in 8 hours?

Name	Position	Rate	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Total
Doe, John-----	Foreman	\$100 a mo.	8	8	8	8	8	8	8
Connor, P-----	Paver	3.75	8	8	8	8	8	0	0
Leoni, L-----	"	3.75	8	4	0	8	8	8	8
Baldino, M-----	Rammer	3.25	8	8	8	8	8	8	8
Hagan, C-----	Laborer	2.50	4	8	8	8	4	0	0
Smith, R-----	"	2.50	8	8	8	8	8	8	8
Jones, H-----	"	2.50	8	6	4	8	8	4	4
Brown, J-----	"	2.50	8	8	8	8	8	8	8
Davis, A-----	Driver and team	5.60	8	8	8	8	8	8	8

Find the weekly time of each man on the above time sheet. 5. (*=25%*). If the above gang paves 507 sq. yds. of granite block during the week, what is the cost of paving 1 sq. yd.?

FOREMAN OF REPAIRS, BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$850 a year, November 20.

*Experience—Weight 4.* See examination for Assistant Foreman, held November 20.

*Practical Questions (Oral)—Weight 6.* 1. Explain how you would cut out a section of bad 6" water main and replace it. 2. Before closing off the water in a section, what should be done, and why? 3. Under what conditions is it necessary to shore a trench? How is a trench shored? 4. Explain how a fire hydrant is connected to the main. 5. Explain the general construction of a large valve such as is used on water mains.

FOREMAN (UNPAVED STREETS AND MACADAM ROADS), BUREAU OF HIGHWAYS, DEPARTMENT OF PUBLIC WORKS, \$100 a month, November 20.

*Experience—Weight 4.* See examination for Assistant Foreman, held November 20.

*Arithmetic—Weight 2.* See examination for Assistant Foreman, held November 20.

*Practical Questions (Oral)—Weight 4.* 1. How should a macadam road containing several large depressions, caused by a sinking of the subgrade, be repaired? 2. (a) What is a scarifier? (b) When should it be used? 3. Describe the process of surface treatment of macadamized roads. 4. If the surface of an unpaved street or dirt road upheaved in freezing weather, what would be the probable cause, and how could it be removed? 5. How should the gutters of an unpaved street on a steep grade be protected from excessive wear from large quantities of storm water?

FOREMAN, BUREAU OF HIGHWAYS, DEPARTMENT OF PUBLIC WORKS, \$100 a month when employed, November 20.

*Experience—Weight 4.* See examination for Assistant Foreman, held November 20.

*Arithmetic—Weight 2.* See examination for Assistant Foreman, held November 20.

*Practical Questions (Oral)—Weight 4.* 1. How should a macadam road containing several large depressions, caused by a sinking of the subgrade, be repaired? 2. (a) What is a scarifier? (b) When should it be used? 3. Describe the process of surface treatment of macadamized roads. 4. (a) What proportions are used in the concrete for the base of street paving? (b) How is it mixed and laid? 5. How are repairs made in a vitrified brick pavement?

FOREMAN OF LABORERS, BUREAU OF CITY PROPERTY, DEPARTMENT OF PUBLIC WORKS, \$3.25 a day, November 21.

*Experience—Weight 5.* See examination for Assistant Foreman, held November 20.

*Practical Questions (Oral)—Weight 5.* 1. Describe how you would move a heavy mahogany desk from an office on the fifth floor to one on the ninth. 2. How would you move a large filled bookcase between the same floors? 3. How would you set a heavy

I beam in position on the top of two columns? 4. Describe the proper method of piling lumber, so that it will season. 5. How would you keep the time of the men under your supervision?

OVERSEER, BUREAU OF CHARITIES, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$1,200 a year, November 21.

*Experience—Weight 3.* See examination for Assistant Foreman, held November 20.

*Practical Questions—Weight 3.* 1. ( $=10\%$ ). What do you understand by a time book? 2. ( $=10\%$ ). Tell how it should be ruled and what information should be put in it. 3. ( $=10\%$ ). What is meant by bonding. 4. ( $=10\%$ ). What do you mean by "headers" and "stretchers"? 5. ( $=10\%$ ). Of what does mortar consist and how is it made? 6. ( $=10\%$ ). In speaking of stone work, what is meant by "perch"? 7. ( $=10\%$ ). What is meant by: (a) A sill; (b) a girder; (c) a ridge pole; (d) sheathing; (e) a joist; (f) a Stillson wrench; (g) a valve; (h) a trap; (i) a union; (j) a tread; (k) a riser? 8. ( $=10\%$ ). What is meant by a "square" of slate? 9. ( $=10\%$ ). Describe briefly how you would build a culvert in one of the driveways in the grounds of the Philadelphia Hospital. 10. ( $=10\%$ ). How would you get information regarding the work done by mechanics and other employees under your charge at the hospital?

*Arithmetic—Weight 2.* 1. (*Credit=18%*). How many feet board measure are there in a piece of lumber 6" x 10" and 24 feet long? 2. ( $=18\%$ ). What would be the cost of 25 of these pieces in question No. 1, at \$35 a thousand feet? 3. ( $=10\%$ ). Add: 97,869; 5,436; 21,764; 379; 24,568; 3,654. 4. ( $=18\%$ ). What is the distance around a plot of ground, the four sides of which measure 75 ft. 3 in., 95 ft. 6 in., 86 ft. 4 in., and 125 ft. 9 in.? 5. ( $=18\%$ ). How many bricks are required to build a wall 12 ft. high, 25 ft. long, and 36 inches thick, allowing 21 bricks to the cubic foot? 6. ( $=18\%$ ). How many gallons are required to paint the walls and ceiling of a room 20 ft. long, 18 ft. wide, and 14 ft. high? There are six windows 2 ft. 6 in. wide by 6 ft. high, and 3 doors 3 ft. by 6 ft. 6 in. high. Allow one gallon of paint for each 200 square feet.

*Report Writing—Weight 2.* Write a report of about 200 words, in the form of a letter, to Hon. William H. Kreider, Secretary, Civil Service Commission, on the subject: "The Inspection of the

Philadelphia General Hospital." Assume any facts that you desire, and make all necessary recommendations for repairs or improvements. Sign the report "*John Doe*."

FOREMAN OF SEWER REPAIRS, BUREAU OF HIGHWAYS, DEPARTMENT OF PUBLIC WORKS, \$100 a month, November 21.

*Experience—Weight 4.* See examination for Assistant Foreman, held November 20.

*Practical Questions (Oral)—Weight 6.* 1. (*Credit=10%*). Name the shapes of sewers usually found in Philadelphia. 2. (=10%). Of what materials are the above sewers constructed? 3. (=10%). How is a sewer supported in marshy ground? 4. (=10%). State the common method of testing brick on sewer work. 5. (=15%). Describe the construction of an egg-shaped brick sewer. 6. (=15%). How is a cave-in of the bottom of a sewer repaired? 7. (=15%). Describe the construction of a grate top inlet. 8. (=15%). Describe two methods of cleaning sewers.





# **SKILLED LABOR SERVICE**

---

**STEAMFITTER, ANY BUREAU, ANY DEPARTMENT, As per Ordinance, March 4.**

*Training and Experience—Weight 4.* 1. What is your age? ....years....months. 2. Did you attend Common School? (Yes or no.) How far did you go in Common School? Did you attend Grammar School? (Yes or no.) How far did you go in Grammar School? Did you attend a Manual Training or Trade School? (Yes or no.) Where did you attend Manual or Trade School? When did you enter Manual or Trade School? When did you leave Manual or Trade School? If you attended Trade School, what trade did you study? 3. Did you serve an apprenticeship in the trade of Steamfitter? (Yes or no.) Give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 4. Have you ever worked at the trade of Steamfitter since you completed your apprenticeship? (Yes or no.) If you answer yes, give details asked in third question. 5. Have you any other trade or occupation? (Yes or no.) If you answer yes, give details asked in third question. 6. Give below detailed information concerning any other work you have done, not mentioned above, which would tend to fit you for this position.

*Practical Questions—Weight 6. (Credit=10%).* 1. (Credit=10%). How many feet of pipe will be required in a steam coil made up of 12' lengths of 1 1/2" steam pipe and return bends to give 120 sq. ft. of heating surface. Allow 36 sq. in. radiation for each return bend. 2. (=10%). A 2" steam pipe is run from wall to wall, a distance of 10 feet; at one end there is an L, at the other a tee, the line continuing through the wall and a 1/2" trap connection runs to the floor. How long would you cut the pipe between the L and the tee. 3. (=10%). A 6" steam main 150 lbs. per square inch pressure is 230' long. How much expansion should be allowed for it, and how should it be taken up? 4. (=10%). What do you understand by the term "Flange joint"? How is it made up? 5. (=10%). Make a sketch showing the proper way of piping a hot-water heating system with six radiators attached, two on the first floor and four on the second floor of a building. 6. (=10%). In running a line of pipe with a globe valve in it, how should the globe valve be set with the pres-

sure above or underneath the valve? Why should it be set in this way? 7. (=10%). After a hot water line has been run and placed in service, several leaks between the threads on pipe and fittings, which would not mend of their own accord, developed? Explain the methods by which these can be stopped. 8. (=30%). Practical Test in the Plumbing Shop, City Hall.

**STEAMFITTER'S HELPER, ANY BUREAU, ANY DEPARTMENT,**  
As per Ordinance, March 4.

*Training and Experience—Weight 3.* For Questions 1, 2 and 5, see Questions 1, 2 and 6, examination for Steamfitter, held March 4.

3. Have you ever worked as a Steamfitter's Helper? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 4. Have you ever worked as a helper in any other trade? (Yes or no.) If you answer yes, give details asked in third question.

*Practical Test—Weight 7.* This will be given in the Plumbing Shop of City Hall.

**SWEeper AND CLEANER (Men), BUREAU OF CITY PROPERTY,  
DEPARTMENT OF PUBLIC WORKS, \$2 a day, March 11.**

*Training and Experience—Weight 5.* NOTE:—All statements made by applicants relating to their experience are subject to investigation and verification; and the misstatement of a material fact will be deemed cause for the removal of a candidate's name from the eligible list. For Questions 1 and 6, see Questions 1 and 6, examination for Steamfitter, held March 4. 2. Did you attend school? (Yes or no.) Where did you attend school? How far did you go in school? 3. Have you ever worked as a Janitor? (Yes or no.) If you worked as a Janitor, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 4. Have you ever been employed as a Window-Washer? (Yes or no.) If you have been employed as a Window-Washer, give details asked in third question. 5. Have you ever worked as a Sweeper and Cleaner? (Yes or no.) If you answer yes, give details asked in third question. 6. Give below detailed information concerning any other work you have done, not mentioned above, which would tend to fit you for this position.

*Practical Questions (Oral)—Weight 5.* 1. How should you clean down the walls of this room? 2. How should you clean a marble floor? 3. How are windows cleaned?

**BLUEPRINTER** (18 years or over), \$600-\$800 a year, March 18.

*Training and Experience—Weight 2.* 1. What is your age? State what school you last attended. What class or grade did you reach? 2. What is your trade or occupation? How many years have you actually worked at it? 3. Referring to the positions you have held, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 4. Give the particulars about any special work you have done, in addition to the above, which tends to qualify you for the position you are now seeking.

*Practical Questions—Weight 8.* 1. (*Credit=15%*). Describe in full the process of making a blueprint. 2. (=15%). How is blueprint paper made? What are the chemicals used? 3. (=10%). What precautions are necessary to protect a print from fading? 4. (=10%). What effect does the age of blueprint paper have on it and what change in treatment does it require? 5. (=10%). How can you clear up an over-exposed print? 6. (=10%). What is linaura? 7. (=15%). What are Vandyke negatives, and how are they made? How are they used? 8. (=15%). What grade of paper and what sort of a solution would you use for blueprints for the following uses: (a) To attach to a lease; (b) to be used in the engineer's office in construction; (c) to mail with the specification to a prospective bidder; (d) to send to the shop; (e) to use in the office to lay out temporary construction?

**BRICKLAYER'S HELPER, ANY BUREAU, ANY DEPARTMENT,** As per Ordinance, March 18.

*Training and Experience—Weight 3.* Do not write your name on this paper, or on any other paper in the examination. 1. What is your age? State what school you last attended. What class or grade did you reach? 2. What is your trade or occupation? How many years have you actually worked at it? 3. Referring to the positions you have held, give names and addresses of employers, character of work done, salaries received and dates of entering and leaving each position. 4. What is the greatest length of time you have worked for an employer? Give dates. Name and address of this employer. Your position and salary. Kind of work you were doing. Reason for leaving. 5. Give in-

formation concerning any other important employment that would fit you for the position you are now seeking. 6. Have you ever acted as Foreman or Superintendent? If so, state the length of time in the position, the character of work, and the number of men under your direction. 7. Do you use alcoholic drinks at all? To what extent? Is your sight good, fair or poor? Is your hearing good, fair or poor? Have you rheumatism? Rupture? Deformity? Lung trouble? Heart trouble? Kidney trouble? Give particulars about the above or any other chronic disease you have. 9. Have you ever left or been discharged from any position on account of quarreling, drinking or absence without leave? If so, state the particulars of the case. 10. Have you ever been charged with any crime or misdemeanor? If so, give dates, charges and results. NOTE:—If there is not enough space on these sheets to answer these questions fully, use the regular examination paper and indicate the number of the question which you are answering.

*Practical Questions (Oral)—Weight 2.* 1. (*Credit=25%*). How is lime mortar made? 2. (*=25%*). Should cement mortar be retempered? Why? 3. (*=25%*). Name the tools used by a bricklayer, and state their uses. 4. (*=25%*). Should bricks be laid wet or dry? Why?

*Physical Fitness—Weight 5.*

FILTER ATTENDANTS, BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$800 a year, March 21.

*Training and Experience—Weight 3.* 1. What is your age? State what school you last attended. What class or grade did you reach? 2. What is your trade or occupation? How many years have you actually worked at it? 3. Referring to the positions you have held, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 4. What is the greatest length of time you have worked for an employer? Give dates. Name and address of this employer. Your position and salary. Kind of work you were doing. Reason for leaving. 5. Give information concerning any other important employment that would fit you for the position you are now seeking. 6. Have you ever left or been discharged from any position on account of quarreling, drinking or absence without leave? If so, state the particulars of the case. 7. Have you ever been charged with any crime or misdemeanor? If so, give dates, charges and results.

*Practical Questions—Weight 7.* 1. (*Credit=10%*). Describe the process of slow-sand filtration. 2. (=15%). By what means can the filter attendant ascertain whether the filter is operating properly or not? 3. (=15%). Explain how the rate of a filter is adjusted. Make a sketch of or describe the apparatus used. 4. (=10%). (a) What is meant by "loss of head" in a filter? (b) How is it measured? 5. (=10%). Explain in detail the method of collecting samples of filtered water. 6. (=15%). Describe the operation of cleaning a filter. 7. (=10%). How many cubic yards of sand are required to construct a 4-ft. sand layer for a filter bed 50 ft. wide by 140 ft. long? 8. (=15%). How is the turbidity of water determined?

FRESCO PAINTER, BUREAU OF CITY PROPERTY, DEPARTMENT OF PUBLIC WORKS, As per Ordinance, March 21.

*Training and Experience—Weight 5.* 1. What is your age? ....years....months. 2. Did you attend Common School? (Yes or no.) How far did you go in Common School? Did you attend Grammar School? (Yes or no.) How far did you go in Grammar School? Where did you attend school? 3. Did you serve an apprenticeship to learn fresco painting? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 4. Have you ever been employed as a Journeyman Fresco Painter? (Yes or no.) If you answer yes, give details asked in third question. 5. Have you any other trade or occupation? (Yes or no.) If you answer yes, give details asked in third question. 6. Give in detail information concerning any other work you have done, not mentioned above, which would fit you for this position.

*Practical Questions—Weight 5.* 1. (*Credit=10%*). How would you prepare new plaster walls and ceilings to tint same in distemper color? 2. (=10%). What would you use as a binder in distemper color if whiting is used? 3. (=10%). How would you prepare stencil paper for cutting stencils? 4. (=10%). How would you prepare stencil paper after stencils are cut, before using same on work? 5. (=10%). What would you use for size on distemper color to gild with gold or metal leaf? 6. (=10%). What is the first thing to be done with a drawing for decoration before using it? 7. (=10%). How many coats of oil color paint should it take on new plaster walls for a flat

finish ready for decorations? 8. (=10%). If decoration is to be glazed after being pounced up, how would you proceed? 9. (=10%). Name some of the principal tints used for glazing decoration. 10. (=10%). Explain how gold leaf lines are run on finished oil color walls or ceilings.

CARPENTER, ANY BUREAU, ANY DEPARTMENT, As per Ordinance, March 25.

*Training and Experience—Weight 4.* See examination for Steamfitter, held March 4.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). What kinds of timber are needed and generally used for heavy framing, such as trusses, girders and posts? State the reasons for using these kinds. 2. (=10%). What kinds of wood are used for floors and other interior finish? 3. (=10%). How many and what kinds of saws should a carpenter's kit contain? Tell the difference in the construction of each of these saws. 4. (=10%). What tools should a carpenter's kit contain for general house carpentry? 5. (=10%). Describe, and if desired, draw sketches of: (a) Common mortise and tenon joint; (b) double tenon joint; (c) a halved joint; (d) a fished splice; (e) dove-tail joint. 6. (=10%). What is the object of cross bridging between joists of floors? How and where should this be done? 7. (=10%). Name the parts of a pitch or gable roof complete. 8. (=10%). How is a new sash cord put in a window? 9. (=10%). Describe the method of making a miter box. 10. (=10%). Compute the number of feet B. M. in the following lumber and its cost:

No. of pieces	Size	Cost per M. ft. B. M.
265	2" x 10" x 16' 0"	@ \$35
175	4" x 6" x 12' 0"	@ \$32
420	3" x 4" x 14' 0"	@ \$28
1,600	7/8" x 10" x 10' 0"	@ \$40

ELEVATOR OPERATOR, ELECTRICAL BUREAU, DEPARTMENT OF PUBLIC SAFETY, \$2.75 a day, May 6.

*Training and Experience—Weight 4.* For Questions 1, 2, 5 and 6, see Questions 1, 2, 5 and 6, examination for Fresco Painter, held March 21. 3. Have you an elevator operator's license? (Yes or no.) If you answer yes, how long have you had the license? ....years,....months. What was the date of

last issue? 4. Have you ever been employed as an elevator operator? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position.

*Practical Questions—Weight 3.* 1. (*Credit=10%*). State briefly what should be done by an elevator operator when starting up in the morning. 2. (*=10%*). What is the purpose of the inside door of an elevator? 3. (*=10%*). What determines the number of persons carried on a car at one time? 4. (*=10%*). How is a car made fast when it is necessary for the operator to leave it for a short while? 5. (*=10%*). What are the most important safety devices used on a passenger elevator? 6. (*=10%*). A car is stopped at a landing and the lever or controller is in the middle position but the door will not open. If there is nothing broken or wrong with the interlock, what is the trouble and what should be done? 7. (*=10%*). What is the air cushion on an elevator? Where is it found? 8. (*=10%*). If a cable broke and your car started to drop, what would happen if the elevator equipment was in good order? 9. (*=10%*). Name the device which would prevent your car from running into the overhead work. 10. (*=10%*). If you had a car full of passengers and put your controller on the "up" motion and your car would not move, what would you do before you asked some passengers to step off?

*Personal Fitness (Oral)—Weight 3.*

CAULKER, BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$1,000 a year, \$3.00 a day, May 8.

*Training and Experience—Weight 4.* 1. What is your age? .... years, .... months. 2. Did you attend Common School? (Yes or no.) Did you attend Grammar School? (Yes or no.) 3. Give the following information for the last day school you attended: Name of school; location of school (city or town); date of entering; date of leaving; grade reached. 4. Have you ever attended Night School? (Yes or no.) What Night School did you attend? How many years did you attend? .... years, .... months. 5. Have you ever been employed as a caulk? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 6. Did you ever caulk a bell-and-spigot joint? (Yes or no.) If you answer yes, give details asked in fifth question. 7. Referring to any other positions you have

held, give details asked in fifth question. 8. Give in detail other information, not mentioned above, which would tend to fit you for this position of caulk.

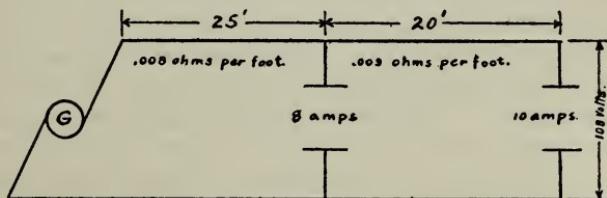
*Practical Question and Test—Weight 6.*

ELECTRICIAN, ANY BUREAU, ANY DEPARTMENT, \$3.20 a day, May 9.

*Training and Experience—Weight 4.* 1. What is your age? ....years,....months. 2. Did you attend school? (Yes or no.) Where did you attend school? How far did you go in school? Did you attend Grammar School? (Yes or no.) How far did you go in Grammar School? Did you attend High or Trade School? (Yes or no.) What High or Trade School did you attend? Did you graduate from High or Trade School? (Yes or no.) What year did you enter? What year did you leave? 3. Have you ever attended Night School while employed? (Yes or no.) What Night School did you attend? What course or courses did you take? Did you complete the course? (Yes or no.) How long did you attend?....years,....months. 4. Have you ever been employed as a lineman, wireman or electrician on outside overhead work? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 5. Have you been employed as a wireman or electrician on inside work? (Yes or no.) If you answer yes, give details asked in fourth question. 6. Have you ever been employed as a lineman's, wireman's or electrician's helper? (Yes or no.) If you answer yes, give details asked in fourth question. 7. Have you ever been employed as a climber? (Yes or no.) If you answer yes, give details asked in fourth question. 8. Have you any other trade or occupation? (Yes or no.) If you answer yes, give details asked in fourth question. 9. Give below detailed information concerning any other work you have done which would tend to fit you for the position you wish.

*Practical Questions—Weight 6.* 1. (*Credit=5%*). Name and explain three different ways of joining copper wire used in electric wiring. 2. (*=10%*). Make a sketch showing the wiring of a shunt motor starting box. 3. (*=10%*). In wiring up an electric generator to the feeder mains, what protective devices should be placed in the circuit? State your reason for placing each one in the circuit. 4. (*=5%*). If a wire had a resistance of .005 per foot, what would be the voltage drop if the line was 150' long

and supplied 20 amps. D. C. for incandescent lighting? 5. ( $=10\%$ ). Show a sketch of the complete connections from the feeder to a 25 H. P. Compound Motor. 6. ( $=5\%$ ). In a vertical run within a building of wires used for electrical signals, such as bells, telephones, annunciators, how must the wires be protected if they are bunched? 7. ( $=5\%$ ). What kind of wire must be used for each of the following: (a) Service arcs on the inside of buildings; (b) acid storage battery room; (c) wires attached to wooden parts of buildings? 8. ( $=5\%$ ). In running a line through a brick wall from the outside of the building to the inside, how should the wires be bushed? 9. ( $=5\%$ ). Make a sketch of the wiring of a simple telephone set and explain how it works. 10. ( $=10\%$ ). Explain the meaning of the following terms: (a) Grounded neutral; (b) time limit relay; (c) junction box; (d) flush switch; (e) floor receptacle; (f) ceiling rosette; (g) cartridge fuse; (h) pull chain socket; (i) secondary wire; (j) bus-bars. 11. ( $=10\%$ ). Suppose an underground line 3 miles long was grounded. Tell and explain in detail how the approximate location of the fault can be determined from either one end or the other. 12. ( $=10\%$ ). A direct current generator supplies current for lighting as shown in the diagram.



If the first bank of lamps takes 8 amps. and the second 10 amps., what will the voltage at the generator have to be to have 108 volts at the second bank of lamps? 13. ( $=10\%$ ). Explain in detail how to test out a compound lap-wound motor to locate a burned out coil.

LINEMAN, ELECTRICAL BUREAU, DEPARTMENT OF PUBLIC SAFETY, \$1,100 a year, May 9.

*Training and Experience—Weight 3.* See examination for Electrician, held May 9.

*Practical Questions—Weight 7.* 1. (*Credit=10%*). Explain a good method of making a ground connection for a lightning arrester placed on a pole outside. 2. ( $=10\%$ ). How is a trans-

former fastened to a pole? Show by sketch, if you desire. 3. (=10%). How should the cross arm be fastened when it is necessary to use two side by side on account of the heavy lines? 4. (=10%). What is a ground detector? Where and how is it used? 5. (=10%). What care must be exercised by a lineman to prevent leakage? 6. (=10%). What precautions are necessary when working on high tension lines? 7. (=10%). A line runs from an underground feeder up the side of a pole through a galvanized iron pipe. Explain how water is kept from getting into the pipe. 8. (=10%). Explain fully how wires are prevented from switching against trees through which they pass without cutting or trimming out any part of the tree. 9. (=10%). In guying a pole, what precautions must be taken to prevent grounding of the line? 10. (=10%). Explain how to tie a line on to a screw-glass insulator.

WIREMAN, ELECTRICAL BUREAU, DEPARTMENT OF PUBLIC SAFETY, \$1,000 a year, May 9.

*Training and Experience—Weight 4.* See examination for Electrician, held May 9.

*Practical Questions—Weight 6.* 1. (*Credit*=10%). Name and explain three different ways of joining copper wire used in electric wiring. 2. (=10%). Make a sketch showing the wiring of a shunt motor starting box. 3. (=10%). In wiring up an electric generator to the feeder mains, what protective devices should be placed in the circuit? State your reasons for placing each one in the circuit. 4. (=10%). If a wire had a resistance of .005 per foot, what would be the voltage drop if the line was 150' long and supplied 20 amps. D. C. for incandescent lighting? 5. (=10%). Show a sketch of the complete connections from the feeder to a 25 H. P. Compound Motor. 6. (=10%). In a vertical run within a building of wires used for electrical signals, such as bells, telephones, annunciators, how must the wires be protected if they are bunched? 7. (=10%). What kind of wire must be used for each of the following: (a) Service arcs on the inside of buildings? (b) Acid storage battery room? (c) Wires attached to wooden parts of buildings? 8. (=10%). In running a line through a brick wall from the outside of the building to the inside, how should the wires be bushed? 9. (=10%). Make a sketch of the wiring of a simple telephone set and explain how it works. 10. (=10%). Explain the meaning of the fol-

lowing terms: (a) Grounded neutral; (b) time limit relay; (c) junction box; (d) flush switch; (e) floor receptacle; (f) ceiling rosette; (g) cartridge fuse; (h) pull chain socket; (i) secondary wire; (j) bus-bars.

**INSTRUMENT INSTALLER AND REPAIRER, ELECTRICAL BUREAU,  
DEPARTMENT OF PUBLIC SAFETY, \$3.00 a day, May 10.**

*Training and Experience—Weight 4.* For Questions 1, 2, 3 and 6 see Questions 1, 2, 3 and 8, examination for Electrician, held May 9. 4. Have you ever worked as an electrician or a wireman? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 5. Have you ever worked as an electrician or wireman's helper? (Yes or no.) If you answer yes, give details asked in fourth question. 7. Give in detail a statement of any telephone or instrument installation or repairing you have done, and how long you worked at this branch.

*Practical Questions—Weight 6. (Credit=10%).* Describe a solid back transmitter and tell how it works. 2. (=10%). Name two common troubles experienced with telephone transmitters and tell how each is remedied. 3. (=10%). What causes the appearance of a station light on a branch exchange board with the receiver on the hook? How is the fault rectified? 4. (=10%). Explain the construction of a Wheatstone bridge and tell how it is used to measure resistance of a telephone circuit. 5. (=10%). A complaint is received on a battery system of speech being feeble while speech transmitted is strong. Name two things which may be the cause and how they are detected. 6. (=10%). What is an "iron box head"? Where is it used? 7. (=10%). Show a wiring diagram of a gong and joker bell circuit used in fire alarm systems. 8. (=10%). What is the effect of a ground on a telephone line? 9. (=10%). What is the purpose of a relay in an electric bell circuit and under what condition would one be used? 10. (=10%). Explain the operation of an annunciator, such as is used on elevators, and show a diagram of a system for use in an elevator for a four-story building.

**OPERATOR, ELECTRICAL BUREAU, DEPARTMENT OF PUBLIC  
SAFETY, \$1,200 a year, May 10.**

*Training and Experience—Weight 3.* For Questions 1 and 2, see Questions 1 and 2, examination for Electrician, held May 9. 3. Have you ever worked as a telephone or telegraph operator?

(Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 4. Have you ever worked as a trouble man or test operator? (Yes or no.) If you answer yes, give details asked in third question. 5. Have you any other trade or occupation? (Yes or no.) If you answer yes, give details asked in third question. 6. Give below detailed information concerning any other work you have done which would tend to fit you for this position.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). Name the lights on a multiple telephone switchboard, and tell what each one is for. 2. (*=10%*). Explain, in detail, how a call is taken up and handled by an operator. 3. (*=10%*). How is a local alarm of fire disposed of? 4. (*=10%*). Explain, in detail, how the operator can tell when a line is busy on a multiple telephone switchboard. 5. (*=10%*). What is meant by the "cord circuit"? What does it consist of? 6. (*=10%*). Explain the meaning of the following: (a) Trunk line; (b) pilot relay; (c) distributing frame. 7. (*=10%*). Explain fully how the jacks are arranged on a large switchboard. 8. (*=10%*). What is "crosstalk"? How is it localized? 9. (*=10%*). How is a ground detected on a telephone line? 10. (*=10%*). What records should be kept in connection with operating a telephone switchboard?

*Typewriting—Weight 1.* NOTE:—Make an exact copy of the following:

#### SIGNALS INCLUDING TELEPHONES AND FIRE ALARM INSTRUMENTS IN MUNICIPAL BUILDINGS

The value and cost of maintaining the instruments outside of City Hall have been charged to the proper systems: telephone, police patrol, etc.

During the year 1914 one private branch telephone exchange was installed in fire headquarters, and the location of two others in the City Treasurer's office was changed. Quite a lot of miscellaneous construction work was also done.

Telephones installed:

Bell system .....	93
Keystone system .....	211

Telephones disconnected:

Bell system .....	.....	30
Keystone system .....	.....	15

Fire alarm instruments:

	Installed	Disconnected	Moved
Joker .....	8	1	1
Gong .....	2	1	2
Register .....	1	—	—

SKILLED LABORER, ELECTRICAL BUREAU, DEPARTMENT OF PUBLIC SAFETY, \$2.75 and \$3 a day, May 11.

*Training and Experience—Weight 5.* For Questions 1 and 2, see Questions 1 and 2, examination for Fresco Painter, held March 21. 3. Have you a trade or occupation? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 4. Have you ever worked on electrical construction? (Yes or no.) If you answer yes, give details asked in third question. 5. Give below detailed information concerning any other work you have done which would fit you for this position.

*Practical Questions and Personal Fitness (Oral)—Weight 5.* 1. How is a cable started and pulled through a pipe conduit? 2. How is a lead sheave used in covering the splice in a cable prepared? 3. Explain the proper way to start to take off from a coil of rubber-covered wire.

LEADER PAVER, BUREAU OF HIGHWAYS, DEPARTMENT OF PUBLIC WORKS, \$4.25 a day, May 12.

*Personal Fitness and Practical Test—Weight 10.* 1. Assume that you are the Leader Paver in charge of a repair gang working on P. R. T. streets. The gang is composed of one leader paver, six pavers, three rammers, twelve laborers and two teams. Make out a "material issue" and also a "progress of material sheet" covering a full day's work on granite block repairs for the above gang on the forms furnished you. Assume any location that you desire. 2. John Jones, one of the laborers in this gang, while acting as a rammer was struck by an automobile truck and seriously injured. Assume any other facts that you may desire and fill in the accident report blank, addressing it to Mr. Robert E. Carney, Assistant Engineer, First District. Sign this report "John Doe."

PAVER, BUREAU OF HIGHWAYS, DEPARTMENT OF PUBLIC WORKS, \$3.75 a day, May 12.

This examination will consist of a practical test in paving.

RAMMER, DEPARTMENT OF PUBLIC WORKS, BUREAU OF HIGHWAYS, \$4.25 a day, May 12.

This examination will consist of a practical test in ramming.

PAINTER, ANY BUREAU, ANY DEPARTMENT, As per Ordinance, May 13.

*Training and Experience—Weight 5.* See examination for Steamfitter, held March 4.

*Practical Questions—Weight 5. (Written—Weight 2.5).* 1. (*Credit=10%*). What is the object of applying paste filler to a wood? How is it applied? 2. (=10%). What kind of woods require liquid filler? How is it applied? 3. (=10%). If one gallon of paint will cover 200 square feet, how much paint must be provided to cover a wall 100 feet long and 12 feet high? 4. (=10%). Tell how to mix the following colors: (a) Green; (b) orange; (c) purple; (d) olive. 5. (=10%). (a) How many coats are required to properly cover new outside work? (b) State the difference between the coats.

*Practical Questions—Weight 5. (Oral—Weight 2.5).* 1. (*Credit=10%*). Give two tests for purity of linseed oil? 2. (=10%). Give three causes for blistering of paint. 3. (=10%). How is shellac mixed and what is used to thin it down? 4. (=10%). What kinds of finish are used in hardwood interiors to bring out the natural grain of the wood? 5. (=10%) What is the groundwork used in graining golden oak?

LABORER (ORAL), ELECTRICAL BUREAU, DEPARTMENT OF PUBLIC SAFETY, \$2.50 a day, May 15.

*Training and Experience—Weight 4.* See examination for Skilled Laborer, held May 11.

*Personal Fitness—Weight 6.* This subject will be graded in an oral interview.

PLUMBER, ANY BUREAU, ANY DEPARTMENT, As per Ordinance, May 17.

*Training and Experience—Weight 5.* For Questions 1, 2, 4, 5, 6 and 7, see examination for Steamfitter, held March 4. 3. Do

you hold a certificate of registration in Philadelphia? (Yes or no.) How long have you been registered?....years....months. What grade of registration is it? How long have you held this grade?....years....months.

*Practical Questions—Weight 5. (Written—Weight 2.5).* 1. (*Credit=10%*). Where should a main trap be located, and on which side should the air inlet be? 2. (=10%). What is the purpose of a vent pipe? How high should it be above the roof? 3. (=10%). State, in detail, how terra cotta pipe should be laid and jointed. 4. (=10%). Explain how a horizontal cast-iron bell and spigot pipe joint is made. 5. (=10%). Name the tools which, in your opinion, are necessary for the complete equipment of a plumbing establishment in Philadelphia.

*Practical Questions—Weight 5. (Oral—Weight 2.5).* 1. (*Credit=10%*). How should a system of drainage be prepared for testing? 2. (=10%). Name three (3) causes for traps losing their water seals, and tell how each should be prevented. 3. (=10%). Describe briefly how a drainage system should be installed in a building. 4. (=10%). What is the cause of hammering in water-supply pipes, and how would you prevent it? 5. (=10%). How are permits obtained for installing a drainage system?

SHIP CARPENTER, DEPARTMENT OF WHARVES, DOCKS AND FERRIES, \$3.50 a day, May 17.

*Training and Experience—Weight 5.* See Questions 1, 2, 3, 4, 5 and 7, examination for Caulker, held May 8.

*Practical Questions—Weight 5.* 1. (*Credit=10%*). Make a sketch showing the stem, the way it is fastened, and the bracing used to stiffen the bow of a wooden boat. 2. (=5%). What is coaming and where is it placed? 3. (=5%). What is a rake timber? Where is it used? 4. (=10%). What is the forward transom log? Where is the after transom log on a dredge? Describe them. 5. (=5%). Where are lumber holes placed? Why are they so located? 6. (=5%). How is a boat salted? 7. (=10%). Define the following terms in building a vessel: (a) Shear log; (b) jack rail; (c) bitts; (d) hatches; (e) house sills. 8. (=10%). What materials are used for caulking vessels and what parts are usually caulked? 9. (=10%). Make a sketch of a corner of a crib, showing how the face timbers are fastened together. 10. (=10%). How would you cut a mortise and tenon joint fastening 2 8" x 8" timbers at right angles? 11.

(==5%). Name the kinds of wood used in ship building and ship repair work. 12. (==10%). Name the principal parts of the frame of a tugboat, and give their location. 13. (==5%). How many board feet of lumber are there in a piece of timber 8" x 8", 20' long?

**CHAUFFEUR (Non-Competitive Examination), DEPARTMENT OF PUBLIC SAFETY, \$1,000 a year, July 6.**

*Training and Experience—Weight 4.* 1. What is your age? State what school you last attended. What class or grade did you reach? 2. What is your trade or occupation? How many years have you actually worked at it? 3. Referring to the positions you have held, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 4. What is the greatest length of time you have worked for an employer? Give details asked in third question. 5. Give, in detail, your experience as a chauffeur. 6. Have you ever worked as a mechanician on gas cars? (Yes or no.) Give details asked in third question. 7. Referring to any other positions you have held, give details asked in third question.

*Practical Questions—Weight 6.* 1. (*Credit*=16%). Explain fully how to start up a car which has been standing in a cold garage over night. 2. (==16%). How is the mixture of gas and air controlled on an automobile? 3. (==16%). What is the effect of a rich mixture on the operation of the car? 4. (==16%). Name two common causes of engine misfire. How are these remedied? 5. (==16%). Explain, in detail, the transmission and gear arrangement on a White car. 6. (==10%). Give the regulations governing traffic around City Hall. 7. (==10%). What directions must traffic take on each of the following streets in the central part of the City: (a) Thirteenth street; (b) Tenth street; (c) Chestnut street; (d) Race street?

**SECOND YEAR APPRENTICE, ELECTRICAL BUREAU, DEPARTMENT OF PUBLIC SAFETY, \$540 a year, August 30.**

*Training and Experience—Weight 3.* 1. What is your age? 2. What school did you last attend? 3. Did you complete the course? If you did not, how far did you go? 4. What electrical work have you done to fit you for this position? State fully its nature and the length of time you have worked at it. 5. What is your present occupation? How long have you worked at it? What salaries have you received? 6. Give the names and ad-

dresses of three of your employers or persons whom you would be willing to have consulted as references.

*Practical Questions—Weight 7.* 1. (*Credit=10%*). Make a freehand sketch, showing the wiring diagram of a police signal box. 2. (=10%). Explain the operation of a police signal box. 3. (=10%). Name three different methods of splicing electric wires. Explain how each is made. 4. (=10%). Name the principal tools found in the kit of an installer working on police signal apparatus in a station house. 5. (=10%). Explain how a police signal box is tested after it is erected. 6. (=10%). Make a sketch, showing the wiring for a desk-set telephone, such as is used in police stations. 7. (=10%). Explain how the receiver hook of a desk-set telephone operates. 8. (=10%). Describe briefly how a lead-covered telephone cable is spliced. State what materials are used in making the splice. 9. (=10%). Explain how the lead sleeve used to cover a splice in a cable is prepared. 10. (=10%). Explain fully how the resistance of a telephone receiver is measured.

BOILERMAKER'S HELPER, ANY BUREAU, ANY DEPARTMENT,  
As per Ordinance, November 4.

*Training and Experience—Weight 4.* See examination for Bricklayer's Helper, held March 18.

*Oral Test—Weight 6.* 1. What is a bucking iron? How is it held? 2. What is a maul? 3. What is a ream? 4. What is a stay bolt? Where is it used? 5. What is a drift pin? How is it used?

WHARF BUILDER, DEPARTMENT OF WHARVES, DOCKS AND FERRIES, \$3.50 a day, November 15.

*Training and Experience—Weight 4.* See examination for Bricklayer's Helper, held March 18.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). Describe a timber bulkhead. 2. (=10%). How are the face timbers in a timber bulkhead fastened? 3. (=10%). (a) What is a guard log? (b) Make a sketch showing a joint in a guard log. 4. (=10%). (a) What woods are used in timber pier construction? (b) Where are they used? 5. (=10%). Describe two kinds of timber piers. 6. (=10%). Define: (a) Bearing pile; (b) spur pile; (c) fender pile. 7. (=10%). How is a drop gangway operated? 8. (=10%). Show, by a sketch, how piles may be braced together. 9. (=10%). (a) What is a butt

joint? (b) Make a sketch, showing how a butt joint is fastened. 10. ( $=10\%$ ). How should a mooring post be fastened to a timber pier?

FARMER (HOUSE AND FOUND), BUREAU OF CHARITIES, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$1,200 a year, November 15.

*Training and Experience—Weight 4.* See examination for Bricklayer's Helper, held March 18.

*Practical Questions—Weight 3.* 1. (*Credit=8%*). Mention and describe in a general way the principal kinds or types of soil at and in the vicinity of Byberry. 2. ( $=8\%$ ). For each of these types of soils name several crops for the production of which it is especially adapted. 3. ( $=8\%$ ). In a general way, what treatment should each of these soils receive in order to produce the best crops mentioned in your answer to Question No. 2? 4. ( $=10\%$ ). If you should visit a farm, what visible conditions or easily ascertainable facts would enable you to tell whether the farmer in charge was successful in his management of the farm? 5. ( $=8\%$ ). Tell, in detail, how a crop of celery should be raised and cared for. 6. ( $=9\%$ ). Discuss the selection of cows for dairy purposes, their care and feeding, and the handling of the milk in a properly conducted dairy. 7. ( $=9\%$ ). Discuss in an article of about 300 words farm management so that there may be the least possible loss or waste, either of time or effort, or by inefficient handling of the plant. 8. ( $=8\%$ ). Discuss in an article of about 200 words the problem of the use of inmates as helpers on a large farm, stating what, in your opinion, would be some of the advantages as well as what disadvantages there might be. 9. ( $=8\%$ ). Describe a silo, and give, in detail, how ensilage should be prepared and stored. 10. ( $=8\%$ ). Discuss the desirability, as well as the necessity, of raising and keeping hogs at a plant like Byberry Farms. State also how these hogs should be selected, fed and cared for. 11. ( $=8\%$ ). Discuss the proper conditions under which the slaughtering of hogs should be done, and how the products should be cured. 12. ( $=8\%$ ). Discuss trucking as it presents itself in the case of a plant like Byberry Farms.

*Oral Test—Weight 3.* 1. How would you arrange so that the largest possible amount of all the products required by the inmates at Byberry Farms and the Philadelphia Hospital could

be raised on the tract known as Byberry Farms? 2. What quantity per acre would you consider a good crop of the following: (a) Wheat; (b) corn; (c) potatoes; (d) oats; (e) hay; (f) alfalfa? 3. What do you understand by rotation of crops, and why is it important? Give a rotation of crops suitable for a farm at Byberry. 4. What equipment of implements and machinery would you consider necessary in order to properly operate a farm of about 800 acres? 5. What improvements or increase in the number of buildings, as well as kind of buildings, would you suggest for the plant at Byberry?

MACHINIST'S HELPER, ANY BUREAU, ANY DEPARTMENT, As per Ordinance, November 11.

*Training and Experience—Weight 3.* See examination for Bricklayer's Helper, held March 18.

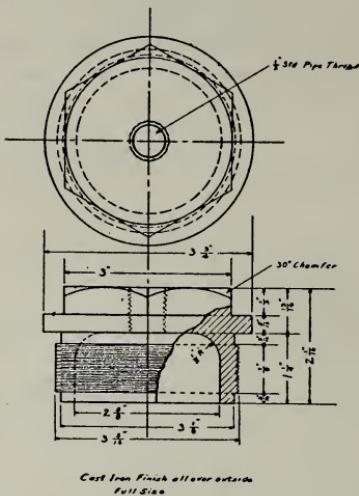
*Oral Test—Weight 7.* 1. What is a jack and what is it used for? 2. What is a cape chisel and what is it used for? 3. How is the diameter of the stock necessary to turn up a small piston determined when the face area is given? 4. Name three machine tools found in machine shops. 5. Why is a machine oiled?

MACHINIST, ANY BUREAU, ANY DEPARTMENT, As per Ordinance, November 15.

*Training and Experience—Weight 4.* See Questions 1, 2, 3, 4, 5 and 7, examination for Caulker, held May 8.

*Practical Questions—Weight 6. (Credit=8%).* How should a drill be started where very accurate work is required? 2. (=7%). If a drill runs out of center in starting a hole, how can it be drawn into center again? 3. (=10%). What is the distinctive difference between a planer and a shaper? 4. (=7%). Explain what causes a planer tool to bite into the work. 5. (=15%). A piece of machinery steel 3" diameter 8" long is to be turned on a lathe. Explain in order each step which should be taken from the time of securing the material until ready to take the first cut. 6. (=8%). With a three-step cone on the feed rod of a lathe which has a back gear, how many speeds can be secured? Tell how to secure each. 7. (=10%). Name and explain the use of three milling machine cutters. 8. (=7%). How and when should a grinding wheel be trued up? 9. (=8%). Show the shape of the following lathe tools: (a) Diamond point tool; (b) cutting-off tool; (c) round nose tool. 10. (=20%).

Explain, in detail, how to proceed to machine the piece shown on the blue print, starting with the stock material and going through the successive steps to the finished product.



TINSMITH, As per Ordinance, November 22.

*Experience—Weight 5.* See questions 1, 2, 3, 4, 5 and 7, examination for Caulker, held May 8.

*Practical Questions (Oral)—Weight 5.* 1. How is a standing seam tin roof put down? 2. How should a large soldering bolt be tinned? 3. How is a joint made between galvanized iron and copper? 4. How is a good roof paint mixed? 5. How wide a sheet of galvanized iron would be necessary to make up a piece of 3" round spouting? What kind of a joint would be used for such spouting?

# SPECIAL SERVICE

## NON-COMPETITIVE EXAMINATION.

MESSENGER, DIRECTOR'S OFFICE, DEPARTMENT OF PUBLIC SAFETY, \$1,000 a year, February 10.

*Arithmetic*—Weight 1. 1. Add 75,684, 92,576, 8,962, 172,596, 35,479. 2. Subtract 129,467 from 396,745. 3. Find the number of letters handled in 30 days by a Messenger who delivers 127 letters a day and works 26 days a month. 4. If a man's salary is \$84.50 a month, and he works 26 days a month, how much is he paid for 1 day's work? 5. What is the sum of  $1/2$ ,  $3/4$  and  $7/8$ ?

*Copying from Plain Copy*.—Weight 1. Make an exact copy of the following: The boot, shoe, leather and textile industries are flourishing. In the shoe business alone more than 100,000 employees are at work, and more are in demand. While there are many large army orders, the bulk of the present trade is normal domestic business. Markets in every State, including all the Southern States, are in satisfactory condition. About 1,000 shoe factories are busy in New England today. One or two of the largest concerns are far behind their orders. New England is now producing about 75 per cent. of the boots, shoes and slippers in the United States, and if activity continues as at present, the output for 1916 will be more than \$300,000,000.

*Penmanship graded on the entire written work of the examination*—Weight 1.

*Personal Fitness (Oral)*—Weight 4.

*Reading*—Weight 2. Read the following names and addresses (three to be written by different persons). Read the following paragraph: With a drop of 25 degrees in less than nine hours, a cold wave from the west gave a sudden twist to the weather yesterday and turned spring into winter. The mercury hovered about the 20 degree mark last night and Forecaster Bliss says it may go lower before daybreak. At 12.30 P. M. the thermometer registered 45 degrees, and then it began a gradual drop. The decline was accompanied by a brisk gale from the northwest, which attained a velocity of thirty-four miles an hour at one time. At 9 o'clock last night the official thermometer registered 20 degrees.

*Spelling to be Dictated*—Weight 1. 1. Arrange. 2. Cleaners. 3. Deliver. 4. Entrance. 5. Simple. 6. Regular. 7. Septem-

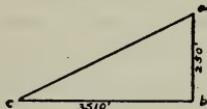
ber. 8. Carry. 9. Allow. 10. Going. 11. Active. 12. Judgment. 13. Certainly. 14. Balance. 15. Attend. 16. Window. 17. Practical. 18. Necessary. 19. Position. 20. Habits.

Pilot, Bureau of Police, Department of Public Safety, \$1,250 a year, March 2.

*Training and Experience—Weight 4.* 1. What is your age? ....years....months. 2. Did you attend Common School? (Yes or no.) How far did you go in Common School? Did you attend Grammar School? (Yes or no.) How far did you go in Grammar School? Did you attend High School? (Yes or no.) Where did you attend High School? Did you graduate from High School? When did you enter? When did you leave? 3. Have you ever attended a Nautical School? (Yes or no.) If you answer yes, fill in the following: Name of school; location of school. What did the course include? How long did you attend? ....years....months. 4. Are you a licensed pilot? (Yes or no.) How long have you had a license? ....years....months. Where was it issued? What grade is it? What territory does it cover? 5. Referring to the positions of Pilot you have held, give names and addresses of employers, name and tonnage of vessel, kind of service engaged in, and dates of entering and leaving each position. 6. Give below in detail a statement of your experience on board boat prior to becoming a Pilot. (In this statement give the name of employer, the boat, length of time employed, with the dates, and salary received.) 7. Give below a detailed account of any other work, not mentioned above, which would fit you for this position.

*Practical Questions—Weight 6. (Credit—9%).* If your vessel was proceeding down stream from Market street, Philadelphia, and another steam vessel from the Camden side, coming directly for you with possibility of a collision, what should you do? What should the approaching steamer do? 2. (=9%). Explain fully, with reasons, how a pilot would proceed from Philadelphia to Chester, if the ranges could not be seen due to heavy fog. 3. (=9%). What is the strength of the tide, in miles per hour, in the Delaware River, an hour before and after changing? 4. (=9%). How can a compass error be corrected without the use of a magnet or readjustment by an expert, if the compass did not correspond with the courses given for navigation in the Delaware River? 5. (=9%). After leaving Greenwich Point

at night, explain how to proceed down around Horseshoe Shoal to a point opposite Fort Mifflin. 6. (=9%). Explain, in detail, how to take a vessel from a point opposite Rock Island to Point Breeze. What is the maximum draft vessel which can be taken to this destination on low water? 7. (=9%). Explain, in detail, how to proceed from Dickinson Street Wharf to Port Richmond, with a 22' draft vessel, on low water. 8. (=9%). With a vessel having a speed of 8 knots an hour, how long would it take to go from Chestnut Street Wharf to the Quarantine Station at Marcus Hook, stemming the tide the entire way? 9. (=9%). What is a Log Book, and what entries are made in it. 10. (=9%). What is the effect of a cross wind of about 30 miles an hour on the navigation of a vessel? How is it taken care of? *Arithmetic:* 11. (=2%). The distance from a to b is 250', and from b to c 3,510', how far is it from c to a if ab and bc are at right angles?



12. (=3%). The coal consumption of a vessel is 4.8 tons per 24 hours. If the weight of a cubic foot of soft coal is 55 lbs., on the basis of 2,000 lbs. to the ton, what would be the size of the bunker in cubic feet to last ten days, running 9 hours a day? 13. (=3%). One vessel having a speed of 8 knots an hour leaves Chestnut Street Wharf at 10.00 A. M. At 11.30 A. M. a vessel with a speed of 12 knots per hour leaves the same place. About where will they come up with one another, and about what time of the day will it be? Neglect the tide conditions in solving the problem. 14. (=2%). The depth of sounding at a point is 4 fathoms at low water. If the tide rises 4 1/2 feet at a uniform rate, what will be the depth each hour until high tide?

JANITRESS, ANY BUREAU, ANY DEPARTMENT, \$600 or less a year, March 3.

*Training and Experience—Weight 5.* 1. What is your age? . . . years . . . months. 2. Did you attend school? (Yes or no.) Where did you attend school? How far did you go in school? 3. Have you ever worked as a Janitress? (Yes or no.) If you worked as a Janitress, give names and addresses of employers,

character of work done, salaries received, and dates of entering and leaving each position. 4. Have you ever worked as a Sweeper or Cleaner? (Yes or no.) If you answer yes, give details asked in third question. 5. Give below detailed information concerning any other work you have done, not mentioned above, which would tend to fit you for this position.

*Practical Questions and Personal Fitness (Oral)—Weight 5.*  
1. What is the best method of cleaning paints? 2. How would you remove ink spots from a varnished top desk? 3. In cleaning a room, which should be done first, sweeping or dusting? Why?

**WATCHMAN (Day), ANY BUREAU, ANY DEPARTMENT, \$600-\$800 a year, March 6.**

*Training and Experience—Weight 3.* For questions 1 and 2, see examination for Janitress, held March 3. 3. Have you ever been employed as a Watchman? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 4. Have you any other trade or occupation? (Yes or no.) If you answer yes, give details asked in third question. 5. Give below detailed information concerning any other work you have done, not mentioned above, which would fit you for this position.

*Arithmetic—Weight 2.5.* 1. (*Credit=25%*). What is the sum of 735, 476, 8,972, 251? 2. (*=25%*). Find the difference between 43,597 and 33,688. 3. (*=25%*). If a man paid \$3 for a dozen collars, how much did each collar cost him? 4. (*=25%*). If a watchman is paid 23 1/2 cents an hour, and is on duty from 7 A. M. to 6 P. M., 6 days a week, how much will he earn each week?

*Copying—Weight 1.5.*

Make an exact copy of the following:

"'Working days' shall be construed to mean total number of days in the period of employment covered, according to the calendar, less Sundays, legal holidays, half-holidays for each week, days employee was prevented from working through no fault of his own."

*Spelling (to be dictated)—Weight 1.* 1. Lumber. 2. Sidewalk. 3. Report. 4. Watchful. 5. Lantern. 6. Unlawful. 7. Permit. 8. Tobacco. 9. Property. 10. Building.

*Oral Examination—Weight 2.* 1. Reading of three names and addresses. 2. What action should a watchman take if he were

continually annoyed by a group of boys while watching materials or property? 3. What should a day watchman assigned to guard a pile of building material in the street see to before he goes off duty in the evening at 6 o'clock?

LABORATORY ASSISTANT (CHEMICAL), BUREAU OF SURVEYS,  
DEPARTMENT OF PUBLIC WORKS, \$900-\$1,000 (Inc.) a year,  
March 7.

*Training and Experience—Weight 24.* 1. What is your age? . . . . years . . . . months. 2. Did you attend Grammar School? (Yes or no.) If so, fill in the following: (a) Date of entrance. (b) Date of graduation or leaving. (c) Reason for leaving. (d) If you were not graduated, state the grade you were in when you left. 3. Did you attend a High School? (Yes or no.) If you answer yes, fill in the following: (a) Name of school. (b) Course pursued. (c) Date of entrance. (d) Date of graduation or leaving. (e) Reason for leaving. (f) If you were not graduated, state the class you were in when you left. 4. Did you attend a Technical School? (Yes or no.) If so, give details asked in third question. 5. Did you attend any evening schools? (Yes or no.) If so, give details asked in third question. 6. (a) What is your trade or occupation? (b) What training did you receive for it? All dates must be given. (c) How long have you followed it? . . . . years . . . . months. 7. Referring to the positions you have held, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 8. Give the names and addresses of your employers whom you would be willing to have consulted as references.

*Practical Questions—Weight 76.* 1. (*Credit=10%*). Convert the following temperatures in degrees Centigrade to degrees Fahrenheit: (a) 95° C.; (b) 5° C. 2. (*=10%*). Describe in detail the method of using a chemist's balance for accurate determinations of weight. 3. (*=10%*). Describe in detail the method of preparing a sample of coal for testing. 4. (*=10%*). Describe the test for determining the percentage of S in coal. 5. (*=10%*). How should a sample of soap be prepared for testing? 6. (*=10%*). Describe the method of determining the number of B. T. U. in a sample of coal. 7. (*=10%*). How is the "flash-point" of an oil determined? 8. (*=10%*). How is a sample of paint prepared when it is desired to test the pigment only? 9. (*=10%*). Describe the method of determining the specific gravity of an oil. 10. (*=10%*). In making a fine-

ness test for sand the total weight of the sand used was 741.67 g., the residues on the different sieves, in the order given, are as follows:

Sieve No.	Residue
200	639.07
100	446.89
80	353.70
50	150.54
40	87.36
30	49.12
20	15.93

Compute the percentage passing each sieve.

LABORATORY ASSISTANT (MACHINIST), BUREAU OF SURVEYS,  
DEPARTMENT OF PUBLIC WORKS, \$900-\$1,000 (Inc.) a year,  
March 7.

*Training and Experience—Weight 3.* 1. What is your age? ....years,....months. 2. Did you attend Common School? (Yes or no.) How far did you go in Common School? Did you attend Grammar School? (Yes or no.) How far did you go in Grammar School? Did you attend a Manual Training or Trade School? (Yes or no.) Where did you attend Manual or Trade School? When did you enter Manual or Trade School? When did you leave Manual or Trade School? If you attended Trade School, what trade did you study? 3. Did you serve an apprenticeship in the trade of machinist? (Yes or no.) Under whom did you serve? What is his address? How long did you serve? ....years,....months. Date beginning? Date ending? 4. Have you ever worked at the trade of machinist since you completed your apprenticeship? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 5. Have you ever been employed as a laboratory machinist? (Yes or no.) If you answer yes, give details asked in fourth question. 6. Give below detailed information concerning any other work you have done, not mentioned above, which would tend to fit you for this position.

*Practical Questions—Weight 7.* 1. (*Credit=9%*). Explain in detail how to machine the brass valve and stem shown in figure 1. In this explanation give each thing which should be done in its proper order, and how to do it. 2. (*=9%*). Explain the

construction of a micrometer and tell how it should be tested and used. 3. ( $=9\%$ ). How can the high mica on a 5 H. P. motor commutator be cut down? 4. ( $=5\%$ ). What is meant by the tensile strength of a material? What is meant by the compressive strength of a material? 5. ( $=9\%$ ). Explain in full how to grind and test a twist drill. 6. ( $=9\%$ ). Explain the difference between a planer and a shaper. Explain what causes chattered work on a planer. 7. ( $=9\%$ ). How are the centers of a lathe trued up? 8 ( $=5\%$ ). A piece of tool steel  $7/8"$  in diameter is to be turned in a lathe. How many revolutions per

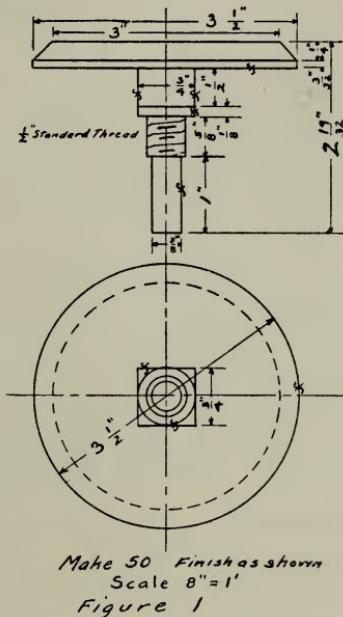


Figure 1

minute should the lathe make to give a cutting speed of  $40'$  per minute? 9. ( $=9\%$ ). A piece of stock  $15"$  long is to be tapered  $1/2"$  to the foot. How much must the poppet head or tail stock be set over. Show all calculations. 10. ( $=9\%$ ). What is the proper angle of clearance on a lathe tool? What is the reason for this amount of clearance? 11. ( $=9\%$ ). What is the index head of a milling machine and for what is it used? 12. ( $=9\%$ ). Explain how to graduate a circular disk of steel into 16 equal parts. Tell what machine would be used and how it would be set up and operated.

LABORATORY ASSISTANT (PHYSICAL), BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS, \$900-\$1,000 (Inc.) a year, November 7.

*Training and Experience—Weight 24.* See examination for Laboratory Assistant (Chemical), held March 7.

*Practical Questions—Weight 76.* 1. (*Credit=12%*). Describe in detail the method of making a complete tension test of steel. 2. ( $=9\%$ ). Draw a stress-deformation diagram for steel and on it designate the elastic limit and yield point. What does each point signify? 3. ( $=12\%$ ). Explain in full the method of making the Rattler test for paving brick. What result should a good brick give? 4. ( $=8\%$ ). Give a complete description of the ductility test for refined asphalt. 5. ( $=12\%$ ). Describe in detail the tensile strength test for Portland cement. State the minimum requirements for tensile strength. 6. ( $=9\%$ ). In sampling a stock of cement, how would you take a sample from a bag, how many bags would you sample, and what size sample is required? 7. ( $=10\%$ ). Describe the method of obtaining the initial and hard sets for Portland cement. 8. ( $=10\%$ ). Describe in detail the mechanical analysis of broken stone. 9. ( $=8\%$ ). A piece of stone is weighed in air and then reweighed submerged in water. The results are: Weight in air, 43.938 g.; weight in water, 25.742 g. What is the specific gravity of the stone? 10. ( $=10\%$ ). A cast iron bar, 26" x 2" x 1", was subjected to a cross-bending test on a 24" span, flatwise. The breaking load was 1955#, concentrated at the center. Compute the modulus of rupture.

#### NON-COMPETITIVE EXAMINATION

SPECIAL AGENT, WHARVES, DOCKS AND FERRIES, \$2,000 a year, March 13.

*Experience—Weight 4.* 1. Submit a complete statement of your general education and training. Give the names of the institutions at which you have studied, the length of attendance (with dates) in each case, and the degree (if any) conferred. 2. Submit a complete statement of your business or professional training and experience, giving the names and addresses of your employers, with dates, the exact nature of your duties with each, salaries received, and reasons for making any change. 3. Submit also a statement of any SPECIAL training you have had, and a list of the books you have read, along the lines that would tend to fit you for this position.

*Thesis—Weight 4.* Write a thesis discussing the need of port development in Philadelphia and outline a publicity plan, having for its object the accomplishment of the above purpose, and suggesting methods by which proper interests and organizations could be enlisted in the furtherance of the project.

*Personal Fitness (Oral)—Weight 2.*

### NON-COMPETITIVE EXAMINATION

CHIEF, DIVISION OF INVESTIGATION AND RESEARCH, CIVIL SERVICE COMMISSION, \$1,800 a year, March 13.

*Experience—Weight 4.* See examination for Special Agent, held March 13.

*Thesis—Weight 4.* Discuss in a thesis of about 1,000 words the importance of the Investigation and Research Work of the Civil Service Commission, what ground it should cover in general and in special cases, and the methods that should be pursued in order to obtain accurate and reliable results and to keep proper records of work done.

*Personal Fitness (Oral)—Weight 2.*

STOREKEEPER, BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$800-\$1,000 a year, March 23.

*Training and Experience—Weight 3.* For Questions 1 and 2, see Questions 1 and 2, examination for Pilot, held March 2. 3. Give the following information for any other school (day or night) you attended: Name of school; location of school; course studied; length of time attended. 4. Have you a trade or occupation? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 5. Give below in detail any other work you have done, not mentioned above, which would fit you for this position.

*Practical Questions—Weight 7.* 1. (*Credit=10%*). Show an outline form of an order sheet which would be appropriate for use in the position you seek. 2. (*=15%*). Outline an accurate method of keeping an account of the distribution of cotton waste to the workmen about the plant so that the exact amount used by each man can be determined. 3. (*=10%*). Explain briefly what is meant by an inventory. How often should an inventory be taken? 4. (*=16%*). How would you suggest storing each of the following articles: 450 water pump valves; 20 gal. lubricat-

ing oil; 6 sizes of Stilson wrenches; sizes of steam pipe ranging from 2" to 6"? 5. ( $=12\%$ ). Give a brief description of the following articles: (a) Block and tackle; (b) stud bolts; (c) 3 way ell; (d) set of caulking tools for lead joints in bell-and-spigot pipe? 6. ( $=10\%$ ). A man ships 3 gross of water pump valves. How many dozen would this be? 7. ( $=15\%$ ). A bin contains 568 one-half inch bolts 3" long. On March 1, 25 were taken out of the storeroom; on March 2, 36 were taken out; on March 4, 14 were returned; on March 8, 9 were taken out; on March 9, 124 were taken out; and on March 10, 33 were returned. How many bolts were left in the bin on March 11? Show how a record of these bolts should be kept. 8. ( $=12\%$ ). How long a piece of round packing would a man require to put 4 rings around a 4" diameter piston rod?

MESSENGER, ANY BUREAU, ANY DEPARTMENT, \$900 a year, March 30.

*City Information—Weight 1.5.* 1. (*Credit=10%*). Give the location of the following offices: (a) Chief of the Bureau of City Property; (b) Recorder of Deeds; (c) City Controller; (d) Chief of Bureau of Health; (e) Director of the Department of City Transit; (f) County Commissioners; (g) Bureau of Highways; (h) Director of Wharves, Docks and Ferries; (i) Chief of the Electrical Bureau; (j) The Mayor's Office. 2. ( $=25\%$ ). Give the location of each of the following buildings: (a) Lincoln Building; (b) North American Building; (c) Real Estate Trust Co.; (d) U. G. I. Building; (e) Pennsylvania Building. 3. ( $=25\%$ ). Tell definitely where the following streets are located: (a) Woodland Avenue; (b) Poplar Street; (c) Locust Street; (d) Randolph Street; (e) Ridge Avenue. 4. ( $=20\%$ ). What streets cross Broad Street at: (a) 1400 North; (b) 2500 North; (c) 700 South; (d) 1200 South; (e) 300 North? 5. ( $=20\%$ ). Explain the quickest way to walk from City Hall to: (a) Third and Callowhill; (b) Eighteenth and Pine; (c) Fourth and Locust; (d) Twentieth and Race.

*Spelling—Weight .5.* 1. Window. 2. Stairway. 3. Telephone. 4. Writing. 5. Favored. 6. Natural. 7. Storage. 8. Nation. 9. Uniform. 10. Remain. 11. Parcel. 12. Absent. 13. Careful. 14. Distance. 15. Action. 16. Service. 17. Prepare. 18. Memory. 19. Possible. 20. Merit.

*Arithmetic—Weight 1.* 1. (*Credit=25%*). Find the sum of: 5,289, 6,982, 8,359, 7,276, 1,798. 2. ( $=25\%$ ). Find the differ-

ence between: 35,926, 29,237. 3. (=25%). A man spends 17 cents a week for newspapers. What will he spend in 52 weeks? 4. (=25%). A messenger has 945 books to deliver. If he can carry 35 books each trip, how many trips will he have to make?

*Reading—Weight 2.* Read the following names and addresses: (two to be written by different persons). Read the following paragraph: One of the best things in the world to be is a boy. It requires no experience, though it needs some practice to be a good one. The disadvantage of the position is that it does not last long enough; it is soon over; just as you get used to being a boy, you have to be something else, with a good deal of more work to do and not half so much fun.

*Copying from Plain Copy—Weight 1.* Make an exact copy of the following:

#### BIG REVENUE FOR COUNTY.

"With a charge of \$1 for the filing of a claim where the amount involved is \$50 or less, and another charge of \$1 when the case is settled, the county would receive a handsome revenue over and above the expenses of trial of 100,000 suits annually, which is a reasonable estimate in comparison with the legal work of this character transacted in other cities. The Municipal Court of Cleveland handles at least 60,000 of these cases each year in its conciliation branch. It is estimated that the conciliation branch of the Municipal Court of New York will handle at least 500,000 of these cases each year."

*Penmanship—Weight 1.* This subject will be marked on the entire work of the examination.

*Personal Fitness—Weight 3.*

MESSENDER, ANY BUREAU, ANY DEPARTMENT, \$600 a year, April 27.

*Copying from Plain Copy—Weight 1.* NOTE:—Make an exact copy of the following: In the days when Old Rome was at the height of glory, a rose hung over a banquet table indicated that that which was spoken at the board was not to be repeated—hence the meaning of secrecy given to the expression "sub rosa"—under the rose.

*Personal Fitness—Weight 4.*

*Reading—Weight 2.* Read the following names and addresses (two to be written by different persons.) Read the following paragraph: The Arabs make the horse a companion. He is never

whipped. Their horses have even been known to pick up and carry away to safety their wounded masters.

*Arithmetic—Weight 1.* 1. (*Credit=25%*). Find the sum of the following: 5,650, 8,944, 7,562, 7,928. 2. (*=25%*). Find the difference between 12,560 and 9,490. 3. (*=25%*). Multiply 8,592 by 7. 4. (*=25%*). Divide 2,340 by 12.

*Penmanship—Weight 1.* Penmanship will be graded on the entire examination.

*Spelling—Weight 1.* 1. Friend. 2. Every. 3. Pencil. 4. Foot. 5. Climb. 6. Please. 7. Wagon. 8. Wealthy. 9. Enough. 10. Table. 11. Make. 12. Habit. 13. Gave. 14. Holiday. 15. Visit. 16. Wheel. 17. Honest. 18. Color. 19. Beggar. 20. Quarter.

ASSISTANT BACTERIOLOGIST, BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$1,200 a year, April 28.

*Training and Experience—Weight 3.* 1. What is your age? ....years....months. 2. Name schools you have attended, courses pursued and degrees received. Give date of graduation. 3. State experience in practical laboratory work, including place, name of employer, salary, kind of work, and length of service. Was it practical or only theoretical? 4. Give any other special information relating to study or experience that would tend to fit you for this position.

*Practical Questions—Weight 7.* 1. (*Credit=5%*). Write a clear and comprehensive statement as to what you understand by each of the following: (a) Bacillus; (b) coccus; (c) spirillum; (d) saprophytic bacteria; (e) parasitic bacteria; (f) anaerobic bacteria, give two examples of each; (g) aerobic bacteria, give two examples of each; (h) facultative bacteria, give two examples of each; (i) nitrosomonas and nitromonas; (j) crenothrix; (k) organic nitrogen; (l) albuminoid ammonia; (m) free ammonia; (n) nitrites and nitrates; (o) bacterial efficiency. 2. (*=15%*). State the four kinds of examinations necessary in conducting a complete sanitary analysis, and explain in detail the value of each for water and for sewage. 3. (*=13%*). (a) How would you clean and sterilize glassware such as is used in a bacteriological laboratory? Explain in detail. (b) How would you store sterile glassware until ready for use? (c) State, in detail, how you would collect samples for bacteriological analysis. What apparatus is used and what precautions are necessary? 4. (*=13%*).

(a) Outline in parallel the standard methods for making nutrient gelatine and agar. (b) How would you prepare diluting water? (c) How would you sterilize each of the above? 5. ( $=13\%$ ). Give concisely the technique for plating samples of each of the following: (a) Filtered City water. (b) Septic sewage and settled sewage. (c) The effluent from a percolating filter which has been disinfected with a chloride of lime solution, whose strength was such that 10 parts per million available chlorine was added. (d) How would you obtain the "counts" from the above plates and how would you report your results? 6. ( $=9\%$ ). (a) How would you determine the percentage of nitrogen in sewage sludge? (b) How would you determine the percentage of available chlorine in hypochlorite of lime? (c) How would you determine the strength of hypochlorite of lime solutions? 7. ( $=20\%$ ). (a) In what three ways may approximate quantitative determinations of B. Coli be made? Explain in detail. (b) State kinds of media used, and how would you report the results? (c) How would you proceed with the isolation tests of B. Coli? Explain in detail. (d) State the diagnostic characteristics for B. Coli. (e) How do these characteristics differ from the corresponding ones for B. Typhosus? 8. ( $=12\%$ ). Write a report to the Chief of the Bureau of Water on "The Value of Filtration of Public Water Supplies as Shown by the Typhoid Death Rate." This report shall be limited to 1,000 words. Sign this report "*John Doe.*"

ASSISTANT CHEMIST, BUREAU OF SURVEYS, DEPARTMENT OF PUBLIC WORKS, \$1,200-\$1,300 (Inc.) a year, May 18.

*Training and Experience—Weight 4.* 1. What is your age? 2. At what technical schools did you obtain your education? 3. In general, what is your occupation, and how long have you followed it? 4. When, where and for whom have you worked at this occupation, stating salary received in each position? 5. From what positions have you been discharged for cause, and what were the causes? 6. State exactly and in detail the sort of work you were doing in the positions you have filled in the past five years. 7. Give the particulars about any analytical work you have done in addition to the above.

*Practical Questions—Weight 6.* NOTE:—Indicate by chemical equations the reaction that takes place; where not possible, indicate in a general way the chemistry of the reaction. 1. (*Credit*

—10%). State the constituents of a bronze, and show how the amount of each can be determined. 2. (=10%). Outline the method for the determination of nitrogen, potash and available phosphoric acid in a fertilizer. What is meant by available phosphoric acid? 3. (=10%). Give in outline the method for the quantitative analysis of a Portland cement. 4. (=10%). What tests would you use for determining the purity of a linseed oil? Outline the method of each test. 5. (=10%). The following is the composition of a yellow paint: Silica, barytes, white lead, lead sulphate, zinc oxide and lead chromate. How would you determine the amount of each present? Indicate, by numerical examples, the necessary calculations. 6. (=10%). In a sample of molasses what kinds of sugars would you look for? How would you determine and identify them? 7. (=10%). What tests would you make to determine the legitimate constituents and possible adulterants of a castile soap? Describe these tests. 8. (=10%). Outline the best method and the precautions necessary to observe to determine accurately the specific gravity of: Alcohol, lubricating oil, coal tar pitch, dry red lead and lard. Give a numerical example, using the pycnometer and including its calibration. 9. (=5%). (a) Describe the sources of error in a chemical balance and how to detect them. Indicate clearly the method of calibrating a set of weights. (b) (=5%). Describe briefly the theory and use of a refractometer and a polariscope. 10. (=10%). Given a mixture supposed to be alcohol, water and acetone, how would you separate and prove the identity of each of the constituents? What are the best results that can be expected?

ASSISTANT DISINFECTOR, BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$1,000 a year, May 19.

*Training and Experience—Weight 2.* Any false statement made by the applicant in answering these questions will be regarded as good cause for excluding him from the eligible list, or for removal or discharge during probation or thereafter. For Questions 1, 3, 4, 5, and 6, see Questions 1, 3, 4, 5, and 6, examination for Assistant Chemist, held May 18. 2. (a) In what grade were you when you left the Grammar School? (b) What High School did you attend? How long? What course? (c) What technical training have you had as apprentice, or in business school, or in college, or in technical school? 7. Give the particu-

lars about any special work you have done, in addition to the above, which tends to qualify you for the position you are now seeking.

*Practical Questions—Weight 4.* 1. (*Credit=12%*). State how you would prepare for disinfection a bedroom in which there had been a case of diphtheria. 2. (=12%). State, in detail, how you would disinfect this bedroom. 3. (=12%). Name three of the more common disinfectants. 4. (=12%). What is the purpose of disinfecting a room? 5. (=12%). What personal risk does a disinfecter encounter in handling some of the more powerful disinfectants and how would you protect yourself? 6. (=12%). (a) Give the route you would take in driving from City Hall to Kensington avenue and York street. (b) From Fourth and South to Broad and Jackson streets. 7. (=12%). (a) Name the main streets crossing Broad street, between Girard avenue and Lehigh avenue. (b) Between Chestnut street and Washington avenue. 8. (=16%). Write a report to the Chief Disinfecter, giving all the facts you consider necessary of a disinfection you have made. Assume all the facts necessary. Sign the report "John Doe."

*Personal Fitness, with Knowledge of Driving—Weight 4.*

ASSISTANT PHOTOGRAPHER, ANY BUREAU, EXCEPT POLICE,  
ANY DEPARTMENT, \$600-\$950 a year, May 20.

*Training and Experience—Weight 4.* 1. What is your age? 2. (a) How far did you go in school? (b) Give name of last school attended. (c) Give location of last school attended. (d) Why did you leave? 3. Answer the following questions in regard to each of the positions you have held for at least the last five (5) years: (a) Name of employer; (b) address of employer; (c) kind of work you were doing; (d) date employed; (e) date leaving; (f) salary received; (g) reason for leaving. 4. From what positions have you been discharged? Why? 5. For what firms, studios or departments have you done photographic work? In answering this question state for each firm, studio or department: (a) Kind of work; (b) salary received; (c) length of time employed (give dates). NOTE:—In submitting samples of your photographic work, samples should, if possible, include: (a) An exterior; (b) an interior; (c) a copy of a letter or other document; (d) a machine. Be careful that your name, or any other means of identification, does not appear on the samples submitted.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). (a)

Give method of enlarging on bromide paper; also give formula for development of the same. (b) Enlarging on gaslight paper. Give formula for developing the same. (c) Give method of making lantern slides and kind of plates to be used; also give formula for development. 2. (=10%). What equipment would be required to take an interior photograph, condition unknown? What equipment would be required to take an exterior photograph? What lens would you use? What is meant by local reduction to a negative. Name chemicals used in the same. 3. (=10%). (a) What would you do to improve the condition of a flat negative? (b) What chemicals would you use? 4. (=10%). Give the best and quickest method of reversing a black ink on white background drawing; that is, to white lines on black background. 5. (=10%). How would you copy a blue print, an old faded print and line work? Give the best method and what lens to be used for each. 6. (=10%). What is an apochromatic lens used for? 7. (=10%). What is the action of bromide of potash? 8. (=30%). *Practical Test.*

CITY HALL GUIDE, BUREAU OF CITY PROPERTY, DEPARTMENT OF PUBLIC WORKS, \$3 a day, May 22.

*Training and Experience—Weight 1.* 1. Give the names and addresses of three reputable citizens who will vouch for the truth of your answers on this paper. 2. What is your age?....years ....months. 3. What school did you attend? How far did you go in school? State the number of full years you attended school. ....years. 4. Referring to the chief positions you have held, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 5. For positions you have held which brought you in direct contact with the public, give details asked in fourth question. 6. Have you ever been engaged in any work of a semi-public nature, not mentioned above, where you were required to deal with people in groups or classes, other than in the capacity of foreman or superintendent? If so, mention the work below.

*City Information—Weight 3.* 1. (*Credit=15%*). Suppose you were with a party of out-of-town visitors on the tower of City Hall. Mention five (5) places of general interest to visitors, visible from the tower, and state in what direction and about how far from City Hall each is. 2. (=15%). Name ten (10) large office buildings visible from the tower and locate each. 3.

(=20%). Suppose these visitors asked you about the new subway and elevated high-speed lines. Write a statement of about 100 to 150 words covering what you would tell them. 4. (=10%). Name ten (10) offices in City Hall. 5. (=10%). Tell where five (5) of these are located. 6. (=20%). Give the necessary directions to visitors inquiring how to reach: (a) Willow Grove; (b) Valley Forge; (c) New York; (d) Germantown; (e) Atlantic City. 7. (=10%). Name three (3) large industrial establishments for which Philadelphia is famous.

*Personal Fitness—Weight 5.* This subject will be graded in an oral interview.

*Reading Addresses—Weight 1.* Two, written in different handwriting.

ELEVATOR STARTER (PROMOTION), ELECTRICAL BUREAU, DEPARTMENT OF PUBLIC WORKS, \$3 a day, May 23.

*Training and Experience—Weight 3.* 1. What is your age? ....years....months. 2. Did you attend Common School? (Yes or no.) How far did you go in Common School? Did you attend Grammar Schol? (Yes or no.) How far did you go in Grammar School? Where did you attend school? 3. How long have you been employed as an elevator operator in City Hall? ....years....months. 4. Did you work as an elevator operator before coming with the City? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 5. Have you any other trade or occupation? (Yes or no.) If you answer yes, give details asked in fourth question. 6. Give below detailed information concerning any other work you have done, not mentioned above, which would fit you for this position.

*Practical Questions—Weight 3.* 1. (*Credit=15%*). Explain how a bank of elevators in one of the corners of City Hall should be handled by a starter. 2. (=10%). What action must a starter take in case an accident happens on one of the cars? 3. (=10%). Name two important things which should be observed in operating an elevator. How can a starter determine whether the operators under him are observing these things? 4. (=10%). If one of the cars in a group settled at the landings with the controller in neutral position, what action would you take? 5. (=10%). How would you prevent operators from loafing on the upper floors? 6. (=15%). To what rooms and where would you send

persons wishing: (a) To secure an operating engineer's license; (b) to get a building permit; (c) to give information to the Detective Bureau; (d) to pay taxes; (e) to secure a poultry license? 7. (=10%). To what rooms would you direct persons wishing to see: (a) Director Datesman; (b) Coroner Knight; (c) Sheriff Ransley; (d) Director Wilson; (e) Dr. Owens? 8. (=10%). How would you direct a person from the northwest corner of City Hall to: (a) Room 310; (b) Room 767; (c) Room 433; (d) Room 602; (e) Room 540? 9. (=10%). On what floor are the following offices located: (a) Board of Revision of Taxes; (b) Director of Department of Health and Charities; (c) Board of Viewers of Philadelphia County; (d) Bureau of Lighting; (e) Bureau of Water?

*Personal Fitness—Weight 4.* This subject will be graded in an oral interview.

GUARD AND SUB-GUARD, BUREAU OF CORRECTION, DEPARTMENT OF PUBLIC SAFETY, \$800-\$1,000 a year, May 23.

*Training and Experience—Weight 1.5.* 1. Give the names and addresses of two reputable citizens who will vouch for the truth of your answers on this paper. 2. What is your age? 3. What schools (names and places) did you attend? If you did not finish Grammar School, what was the highest reader you studied? How far did you go in arithmetic (fractions, decimals, practical measurements, percentage or interest)? If you attended High School, or any other school after leaving Grammar School, state where, how long and what course you pursued. 4. Have you learned a trade? If so, what trade? How long have you worked at it? 5. If you have no trade, what is your regular occupation? How long have you worked at it? 6. Give in order of time any positions you have held; names and addresses of employers; character of business; dates and length of employments; duties of your position, and salary received in each case. 7. Have you ever served in any organization of military or fire character? When, where and how long? Why were you discharged? 8. If you have been in business for yourself, state the nature of the business, how long and the average yearly income. 9. Give the names and addresses of three of your employers or citizens whom you are willing to have consulted as references.

*Arithmetic—Weight .5.* NOTE:—No credit will be given for partially correct answers. All work must be shown. 1. (*Credit*

$(=20\%)$ . Add: 2,976, 587, 9,463, 245. 2.  $(=20\%)$ . Subtract 4,174 from 8,245. 3.  $(=15\%)$ . Multiply 6,234 by 7. 4.  $(=15\%)$ . Multiply 2,456 by 43. 5.  $(=15\%)$ . Divide 1,404 by 6. 6.  $(=15\%)$ . Divide 6,250 by 25.

*Penmanship—Weight .5.* This subject will be marked on the entire written work in the examination.

*City Information—Weight 1.* 1. (*Credit=40%*). Give as nearly as you can the location of the following places: (a) Holmesburg; (b) Tacony; (c) Torresdale; (d) Bustleton; (e) Byberry; (f) Somerton; (g) Chestnut Hill; (h) Manayunk; (i) Germantown; (j) Bridesburg. 2.  $(=10\%)$ . Where are the two Philadelphia County Prisons? 3.  $(=10\%)$ . State how you would go by trolley from one of these prisons to the other. 4.  $(=20\%)$ . Name: (a) the Superintendent of the House of Correction; (b) the Director of Public Safety; (c) the Superintendent of Police; (d) the Captain of Detectives. 5.  $(=20\%)$ . Locate: (a) the House of Correction; (b) any one of the large filter plants; (c) the United States Arsenal; (d) the new Home for the Indigent; (e) the Philadelphia Hospital for Contagious Diseases.

*Identification Report—Weight 1.5.* Write a complete description of the examiner who gave you the instructions at the beginning of the examination today.

*Physical Test—Weight 5.*

GUARD (CITY HALL, 25-45 years), BUREAU OF POLICE, DEPARTMENT OF PUBLIC SAFETY, \$2.50 a day, May 24.

GUARD (INDEPENDENCE HALL, 25-45 years), BUREAU OF CITY PROPERTY, DEPARTMENT OF PUBLIC WORKS, \$720 a year, May 24.

WATCHMAN (INDEPENDENCE HALL, 25-45 years), BUREAU OF CITY PROPERTY, DEPARTMENT OF PUBLIC WORKS, \$720 a year, May 24.

SPECIAL OFFICER (25-45 years), ANY BUREAU, ANY DEPARTMENT, \$720-\$900 a year, May 24.

*Training and Experience—Weight 1.* For Questions 1, 2, 4, 5 and 7, see Questions 1, 2, 6, 7 and 8, examination for Laboratory Assistant (Chemical), held March 7. 3. State below any other schools you have attended. Name of school. Course pursued. Dates of attendance. 6. Have you ever been discharged from any

position? (Yes or no.) How many times? If so, state the reasons in full for each case.

*Arithmetic—Weight .5.* 1. (*Credit=20%*). Add 2,378, 7,249, 3,694, 765. 2. (=20%). Subtract 7,129 from 9,764. 3. (=15%). Multiply 5,249 by 4. 4. (=15%). Multiply 2,456 by 35. 5. (=15%). Divide 608 by 4. 6. =(15%). Divide 2,265 by 15.

*Physical Test—Weight 5.*

*Report—Weight 1.* Write a report of about 100 words to the Civil Service Commission, Philadelphia, dated today, giving a brief description of Independence Hall. Sign this report "John Doe."

*Penmanship—Weight .5.* This subject will be marked on the writing in the report.

*Personal Fitness—Weight 2.* This subject will be graded in an oral interview.

JANITOR (ORAL), ANY BUREAU, ANY DEPARTMENT, \$720 or less a year, May 26.

*Training and Experience and Personal Fitness—Weight 5.* 1. What is your age?....years....months. 2. Have you ever worked as a Janitor? (Yes or no.) If you worked as a Janitor, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 3. Have you ever worked as a Sweeper or Cleaner? (Yes or no.) If you answer yes, give details asked in second question. 4. Give below detailed information concerning any other work you have done, not mentioned above, which would tend to fit you for this position.

*Physical Test—Weight 5.*

LAVATORY ATTENDANT (ORAL), ANY BUREAU, ANY DEPARTMENT, \$400-\$480 a year or As per Ordinance, May 29.

This examination will consist of an oral interview.

TELEPHONE SWITCHBOARD OPERATOR (MEN AND WOMEN), ANY BUREAU, ANY DEPARTMENT, \$900 or less a year, May 31.

*Training and Experience—Weight 3.* 1. What is your age? ....years....months. 2. Did you attend Common School? (Yes or no.) Did you attend Grammar School? (Yes or no.) 3. Give the following information for the last day school you attended: Name of school, location of school (city or town),

date of entering, date of leaving, grade reached. 4. Have you ever attended night school? (Yes or no.) What night school did you attend? How many years did you attend?....years months. 5. Have you ever operated a telephone switchboard? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received, and dates of entering and leaving each position. 6. For any other positions you have held, give details asked in fifth question. 7. Give below detailed information concerning any other work you have done, not mentioned above, which would fit you for this position.

*Practical Questions—Weight 2.* 1. (*Credit=12%*). Explain a method of keeping the telephone numbers of persons frequently called so they can be easily obtained. 2. (*=15%*). Explain fully the purpose of the "information operator" in the central station. 3. (*=12%*). What records should a private branch exchange operator keep beside the one mentioned in Question No. 1? 4. (*=12%*). If the ringing key failed to work, how would you call a party in the office to the 'phone without leaving your board? 5. (*=12%*). What disposition would you make of an incoming call for a person not in the office at the time? 6. (*=13%*). A number is given to you by an official. Explain in detail how to handle this outgoing call. 7. (*=12%*). What is the effect of keeping the listening keys open when two or more connections are completed and the persons talking? 8. (*=12%*). A party in the office calls a person in another office. The person called is not in. How would you dispose of this call?

*Personal Fitness and Switchboard Knowledge—Weight 5.*

SPECIAL OFFICER, BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$900 a year, July 10.

*Training and Experience—Weight 1.* See examination for Guard, City Hall, etc., May 24.

*Arithmetic—Weight .5.* 1. (*Credit=15%*). Add 4,316, 1,792, 5,325, 2,457. 2. (*=15%*). Subtract 2,814 from 8,713. 3. (*=15%*). Multiply 4,751 by 5. 4. (*=20%*). Multiply 350 by 27. 5. (*=15%*). Divide 534 by 3. 6. (*=20%*). Divide 9,468 by 12.

*Personal Fitness—Weight 2.*

*Physical Test—Weight 5.*

*Report—Weight 1.* Write a report of about 150 words in the form of a letter to Honorable Robert M. Griffith, Civil Service Commission, Philadelphia, giving an account of the stealing of a

stop-valve by a driver hauling cement. Make any other assumptions that you desire. Sign this report "John Doe."

*Penmanship—Weight .5.* This subject will be graded on the writing in the report.

#### NON-COMPETITIVE EXAMINATION.

**WATCHMAN, BOARD OF RECREATION, \$600 a year, July 20.**

*Personal Fitness and Experience—Weight 5.* 1. What is your age?.....years....months. 2. Did you attend school? (Yes or no.) Where did you attend school? How far did you go in school? 3. Have you ever been employed as a Watchman? (Yes or no.) If you answer yes, give names and addresses of employers, character of work done, salaries received and dates of entering and leaving each position. 4. Have you any other trade or occupation? (Yes or no.) If you answer yes, give details asked in third question. 5. Give below detailed information concerning any other work you have done, not mentioned above, which would fit you for this position.

*Physical Test—Weight 5.*

**BACTERIOLOGIST, BUREAU OF WATER, DEPARTMENT OF PUBLIC WORKS, \$1,500 a year, July 21.**

*Training and Experience—Weight 3.* See examination for Assistant Bacteriologist, held April 28.

*Practical Questions—Weight 7.* 1. (=10%). Name the three methods for determining turbidity in water and state the apparatus needed and the procedure followed in carrying out each. 2. (=8%). (a) Convert 795.2 parts per million into grains per gallon. Show computation. (b) Convert 827.6 parts per million into pounds per million gallons. Show computation. (c) Explain clearly how you would determine the turbidity of washed filter sand. 3. (=10%). (a) Give in detail the two methods for determining the amount of nitrate in water. (b) Give in detail the method for determining the strength of chloride of lime. 4. (=10%). (a) State the three methods used for determining oxygen consumed in water. Describe one method in detail. (b) Describe the method of determining dissolved oxygen in water. 5. (=10%). If a sample of water is submitted for a sanitary analysis, what chemical tests would you make? Which are most important, and why? 6. (=12%). Give a general list of apparatus needed for operating a bacteriological laboratory handling ten samples of water daily. 7. (=10%).

Describe in detail the entire process of making nutrient gelatine and agar. 8. ( $=15\%$ ). (a) Give a complete description of how the Philadelphia water supply is filtered and made potable. (b) How is sewage treated? 9. ( $=10\%$ ). Differentiate between B. Coli and B. Typhi. 10. ( $=5\%$ ). Define the following: (a) Aerobic bacteria; (b) anaerobic bacteria; (c) facultative bacteria; (d) stab culture. How made? (e) smear culture. How made? (f) plate culture; (g) streptococci; (h) staphylococci; (i) bacillus; (j) saprophytes and parasites; (k) bacterial efficiency.

CHILDREN'S AGENT, BUREAU OF CHARITIES, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$1,350 a year, September 11.

*Training and Experience—Weight 3.* 1. What is your age? 2. Did you attend Grammar School? (Yes or no.) Were you graduated from Grammar School? (Yes or no.) If so, give date of graduation. If you were not graduated, give the date of leaving and the grade you were in when you left. 3. (a) Did you attend High School? (Yes or no.) (b) If you did attend High School, how long did you remain there, and on what date (month and year) did you leave High School? (c) If you were graduated from High School, give the date (month and year) of your graduation. 4. (a) Have you pursued any course of study in school (business, trade, technical) since leaving High School? If so, give names of schools, dates of entering and dates of leaving, courses or course pursued, and whether you finished the course or not. (b) If you attended night school, give dates and tell what occupation you followed while attending night school. 5. In general, what is your occupation? How long have you followed it? 6. (a) Give the names, addresses and kind of businesses of all your employers. (b) State the title of the position you held under each employer, salary received, the length of time you were employed, giving dates, and the reasons for leaving each employer. 7. From what positions have you been discharged for cause and what were the causes? 8. State exactly and in detail the kind of work you were doing in each of the leading positions you have filled in the past five years. 9. State definitely what training and experience you have had as a Social Service Worker. 10. Give the particulars about any special work you have done, in addition to the above, which tends to qualify you for the position you are now seeking.

*Practical Questions—Weight 5.* 1. (=15%). Give a brief summary of the laws of Pennsylvania relating to children, in so far as they apply to the Bureau of Charities in the Department of Health and Charities of the City of Philadelphia. 2. (=12%). What are the chief facilities of the City and State, public and private, for the care of the various kinds of children who become wards of the Department of Public Health and Charities? 3. (=12%). State briefly what kinds of children may properly become charges upon the Department of Public Health and Charities. 4. (=12%). What kind of investigation and examination in the case of a defective child would you have made before asking for its transfer to an institution? Briefly illustrate by citing three types of defectives, either physical or mental. 5. (=12%). State the kinds of wards of the Department whom you would consider available for legal adoption. 6. (=12%). State briefly what investigation you would make and what action you would take in regard to: (a) Parents who fail to pay board for a child where a court order has been made; (b) parents who have deserted or abandoned their children. 7. (=25%). State briefly in general terms upon what basis you would decide whether or not to keep an unmarried mother and her baby together, giving consideration to the following points: (a) Value of breast feeding in normal cases; (b) age and physical and mental condition of the mother; (c) probable ability of the mother to support herself and the child; (d) legal and financial responsibility of the father of the child if he can be found; (e) probable fitness of the mother to care properly for the child after the nursing period; (f) in making a decision for or against the separation of an infant from an unmarried mother, what consideration would you give to the probable cost of each method to the Department in the long run? In addition to your own opinion, state what you understand to be the trend of opinion and practice at the present time among the more experienced children's workers.

*Judgment, Tact and Personality—Weight 2.* This will be graded in an oral interview.

CAPTAIN OF THE HALL (MEN), BUREAU OF CHARITIES, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$600 a year, November 11.

*Training and Experience—Weight 5.* See Questions 1, 2, 3, 4, 5, 6, 7, 8 and 10, examination for Children's Agent, held September 11.

*Oral Test—Weight 5.* 1. Explain a system whereby only visitors and persons in authority could get in and out of the grounds of a hospital which had but one exit for such use. 2. What records would you keep as Captain of the Hall? 3. How can a person in charge of watchmen tell whether each man is doing his work properly? 4. If a watchman was careless in his work, what action should be taken?

SPECIAL AGENT AND VISITOR, BUREAU OF CHARITIES, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$750-\$1,200 a year, November 15.

*Training and Experience—Weight 4.* See Questions 1, 2, 3, 4, 5, 6, 7, 8 and 10, examination for Children's Agent, held September 11.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). (a) What do you consider to be the functions of a social service department in a hospital? (b) In what way can social service work be of assistance to physicians and nurses connected with a hospital? 2. (*=10%*). What is the function of such an institution as the Philadelphia Hospital in a community such as Philadelphia? 3. (*=10%*). (a) In what way do you consider you would as special agent of the Social Service Division of the Department of Public Health and Charities come in contact with privately supported health and charitable agencies? (b) What privately supported agencies in Philadelphia and in the State would you expect co-operation from in your work as Special Agent? (c) What types of cases would you refer to each of the agencies mentioned above? (d) In referring a definite case to another agency, what would determine your closing or continuing the case? (e) What means would you use to effect helpful co-operation between your Department and other social agencies? 4. (*=10%*). State the procedure you would follow if sent by the physician in charge of the Hospital for Contagious Diseases to visit a home to ascertain whether the home conditions justified the returning of a child immediately following the necessary hospital quarantine. 5. (*=10%*). If the father of a family is admitted to a hospital and your home investigation would show the family to consist of a mother and six children from six months to nine years of age, penniless, without food and having no source

of revenue, what action would you take? 6. (=10%). State your procedure in the following case: A child is admitted to the Philadelphia Hospital as a vaginitis case. You find on visiting the home of the child that the father is tubercular, that the mother is working away from her home, that there are three other children in the family, that the child who is in the hospital has been sleeping with an older sister who is eleven years old, that the total income of the family is five dollars per week. 7. (=10%). State your procedure in the following case: Woman admitted to hospital for operation for appendicitis. On visiting home you find family has been living in Philadelphia one week, having come to Philadelphia from New York State; the father is working intermittently; the average income of the family is seven dollars a week; there are three children in the family, ages thirteen years, five years, and nine months; children are not attending school; oldest sister evidently an inactive tubercular case; youngest child having trouble with eyes; oldest girl working in cigar factory. 8. (=10%). What action should be taken regarding a dependent mother with an illegitimate baby ready for dismissal from the hospital? 9. (=10%). If you found that the institutions for feeble-minded children were filled and had long waiting lists, what action would you take to secure care for an eight-year old homeless girl who is reported by a layman to be feeble-minded? Would your plan of procedure be different if the girl was fourteen years old? 10. (=10%). Name six books discussing important phases of social work which have proved stimulating to you. Discuss one book in not more than two hundred words.

DIETITIAN, BUREAU OF HEALTH, DEPARTMENT OF PUBLIC  
HEALTH AND CHARITIES, \$1,200 a year, November 15.

*Training and Experience—Weight 4.* 1. Give the names and addresses of two reputable citizens who will vouch for the truth of your answers on this paper. 2. What is your age? 3. What school courses have you had in preparation on the work of a Dietitian? 4. Give an outline of your experience as a Dietitian, giving names of employers, dates and character of employment. 5. Give a statement of any additional studies or employment that tend to qualify you for this work.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). Name

a vegetable proteid, fat, carbohydrate. Name an animal proteid, fat, carbohydrate. 2. ( $=10\%$ ). What is the difference between the advantage and disadvantage of raw as against cooked food? Give examples. 3. ( $=10\%$ ). Calories. What is a calorie? What is the usual abbreviation? How many calories should be contained in the daily diet of: (a) A bed-fast patient; (b) a nurse on duty; (c) a ward helper, male? How many calories are there in 1 egg, 1 pint of whole milk, 1 pint of skim milk, 1 pint of 32% cream, 1 lb. of butter, 1 lb. of beef, 1 oz. of beef juice, 8 oz. of beef tea made from the extract, 1 oz. sugar, 1 oz. wheat starch? 4. ( $=10\%$ ). Describe the method of pasteurizing, sterilizing, peptonizing, making artificial buttermilk, cottage cheese, protein milk and junket ice cream. 5. ( $=10\%$ ). Describe the process and tell the changes incident to: (a) Roasting and broiling beef; (b) baking a potato; (c) which is preferable, boiled or steamed rice, boiled or baked potato? Why? 6. ( $=10\%$ ). Give a menu for one day for a case of: (a) Diabetes; (b) pneumonia; (c) typhoid fever; (d) a nursing mother; (e) a case of dropsy, with weak heart. 7. ( $=10\%$ ). What part of the animal yields: (a) Sirloin; (b) tenderloin; (c) fillet; (d) brisket; (e) round steak? What is a crown roast? You may make a diagram if you so desire. 8. ( $=10\%$ ). What are the current prices for: (a) Eggs; (b) butter; (c) onions; (d) beef; (e) bacon; (f) beans (dried); (g) oranges; (h) lemons? 9. ( $=10\%$ ). How do intestinal parasites contaminate food? Name some. How may the risk of them be avoided? 10. ( $=10\%$ ). What proportion of proteid, fat and carbohydrate should be represented in a complete food for an adult?

ASSISTANT DIETITIAN, BUREAU OF CHARITIES, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$900 a year, November 15.

*Training and Experience—Weight 3.* See examination for Dietitian, held November 15.

*Practical Questions—Weight 7.* 1. (*Credit=14%*). Name a vegetable proteid, fat, carbohydrate. Name an animal proteid, fat, carbohydrate. 2. ( $=14\%$ ). What is the difference between the advantage and disadvantage of raw as against cooked food? Give examples. 3. ( $=14\%$ ). Calories. What is a calorie? What is the usual abbreviation? How many calories should be contained in the daily diet of: (a) A bed-fast patient; (b) a nurse on duty; (c) a ward helper, male? How many calories

are there in 1 egg, 1 pint of whole milk, 1 pint of skim milk, 1 pint of 32% cream, 1 lb. of butter, 1 lb. of beef, 1 oz. of beef juice. 8 ozs. of beef tea made from the extract, 1 oz. sugar, 1 oz. wheat starch? 4. (=14%). Describe the method of pasteurizing, sterilizing, peptonizing, making artificial buttermilk, cottage cheese, protein milk and junket ice cream. 5. (=14%). Describe the process and tell the changes incident to: (a) Roasting and broiling beef; (b) baking a potato; (c) which is preferable, boiled or steamed rice, boiled or baked potato? Why? 6. (=15%). Give a menu for one day for a case of: (a) Diabetes; (b) pneumonia; (c) typhoid fever; (d) a nursing mother; (e) a case of dropsy, with weak heart. 7. (=15%). What part of the animal yields: (a) Sirloin; (b) tenderloin; (c) fillet; (d) brisket; (e) round steak? What is a crown roast? You may make a diagram if you so desire.

SPECIAL OFFICER, DEPARTMENT OF WHARVES, DOCKS AND FERRIES, \$720 a year, November 16.

*Training and Experience—Weight 3.* See examination for Guard, etc., held May 24.

*Arithmetic—Weight 1.* 1. (*Credit=25%*). Add 125, 362, 427. 2. (=25%). Subtract 853 from 1,042. 3. (=25%). A man works 308 days in a year at the rate of \$2.25 a day. How much did he earn? 4. (=25%). A barrel of flour contains 196 lbs. If it sells for \$8.82, what is the price per pound?

*Personal Fitness—Weight 4.* This subject will be graded in an oral interview.

*Report Writing—Weight 1.* Write a report of about 100 words in the form of a letter to Honorable Nicholas Albrecht, Civil Service Commission, on the subject: "The Preservation of Order on a City Pier." Sign this report "*John Doe.*"

*Penmanship—Weight 1.* This subject will be graded on the writing of the report.

COLLECTOR OF SPECIMENS, BUREAU OF HEALTH, DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, \$1,000 a year, November 16.

*Training and Experience—Weight 3.* See examination for Assistant Disinfector, held May 19.

*Practical Questions—Weight 7.* 1. (*Credit=10%*). What are the traffic regulations concerning horse-drawn vehicles? 2. (=10%). What precautions should be observed in transporting

fluids containing infectious material? 3. ( $=10\%$ ). Give the usual precautions to be taken for collecting samples of water. 4. ( $=10\%$ ). In collecting animals for laboratory examinations, what care should be taken to transport the specimens to the laboratory? 5. ( $=10\%$ ). In case of accident to the specimen during transportation, what means to safeguard the public should be taken? 6. ( $=10\%$ ). What is understood by disinfection? 7. ( $=10\%$ ). State methods for catching rats so that they will be of use for laboratory examinations. 8. ( $=10\%$ ). What care should be taken of culture specimens and of water and milk specimens after they have arrived at the laboratory. 9. ( $=10\%$ ). What is an incubator and at what temperature should it be kept for cultures? 10. ( $=10\%$ ). How would you take care of a horse in winter and in summer?

**Helper in Antitoxin Laboratory, Bureau of Health, Department of Public Health and Charities, \$800 a year, November 17.**

*Training and Experience—Weight 3.* For Questions 1, 2, and 4, see Questions 1, 2, and 4, examination for Assistant Bacteriologist, held April 28. 3. Give a statement of your experience in laboratory work, including places, names of employers, salaries received, length of service, kind of work, etc.

*Written Work—Weight 2.* Describe the duties of the position for which you apply, mentioning what animals are used in this work and how you would care for them.

*Oral Test—Weight 5.*

**Laboratory Helper (Technical Assistant) (Men and Women), Bureau of Health, Department of Public Health and Charities, \$600 a year, November 17.**

*Training and Experience—Weight 4.* See examination for Helper in Antitoxin Laboratory, held November 17.

*Practical Questions—Weight 6.* 1. (*Credit=10%*). How would you clean and sterilize used and infected test tubes? 2. ( $=10\%$ ). How would you clean used slides and cover slips? 3. ( $=10\%$ ). What is meant by sterilization? What methods for sterilization are commonly used in laboratory and describe in detail. 4. ( $=10\%$ ). Describe in detail the preparation of 1,000 C. C. of broth of meat with a reaction of plus 1.0 and containing 0.1 per cent, dextrose. 5. ( $=10\%$ ). Describe preparation of

Loeffler's blood serum media. 6. ( $=10\%$ ). Describe preparation of Hiss serum water dextrin media. 7. ( $=10\%$ ). Mention three fluids commonly used for the preparation of tissues and describe use of one. 8. ( $=10\%$ ). What two methods are commonly used for embedding tissues and describe technic of one. 9. ( $=10\%$ ). How would you stain a section of tissue with hematoxylin and eosin? 10. ( $=10\%$ ). Describe the method of staining bacteria after the method of Gram.

YARD WATCHMAN, BUREAU OF HIGHWAYS, DEPARTMENT OF PUBLIC WORKS, \$720 a year, November 17.

*Training and Experience—Weight 3.* See Questions 1, 2, 3, 4, 5, 6, 7, 8, and 10, examination for Children's Agent, held September 11.

*Copying Exercise—Weight 2.* Copy the following list of bolts and irons:

*Bill of Bolts in Traveler*

No.	Diameter, In.	Length, Ft.-In.
20	3/4	1-10
125	3/4	1- 8
100	3/4	1- 6
160	3/4	1- 4
150	3/4	1- 2
100	3/4	1- 0
20	3/4	0-10
10	3/4	0- 8
10	3/4	2- 0
10	1 1/4	1- 4

*Bill of Irons in Traveler*

No.	Name
10	Sheave Chocks
4	Bent Bars
4	Bent Bars
2	Bent Bars
2	Bent Bars
16	Scabs
8	Rods
4	Traveler Wheels
8	Wheel Boxes
2	Rods
2	Rods

**Dimensions**

10 1/4 in. Block Sheave  
3 in. x 1/2 in. x 2 ft. 9 in.  
3 in. x 1/2 in. x 3 ft. 5 in.  
3 in. x 1/2 in. x 2 ft. 0 in.  
3 in. x 1/2 in. x 2 ft. 0 in.  
3 in. x 1 in. x 1 ft. 10 in.  
1 1/4 in. diameter x 9 ft. 2 in.  
14 in. diameter, 3 in. shaft

1 1/4 in. diameter x 6 ft. 6 in.  
1 1/4 in. diameter x 3 ft. 6 in.

*Personal Fitness—Weight 5.* This subject will be graded in an oral interview.

**NON-COMPETITIVE EXAMINATION**

ASSISTANT JANITRESS, BOARD OF RECREATION, \$600 a year, November 23.

*Training and Experience—Weight 5.* See examination for Janitress, held March 3.

*Personal Fitness—Weight 5.* 1. (*Credit=25%*). Do you sweep or dust first? Why? 2. (*=25%*). What would you do with papers you found on a desk while cleaning a room? 3. (*=50%*). Appearance, carriage and general alertness.

**TEACHING SERVICE**

PRINCIPAL EVENING RECREATION CENTERS (Men and Women), \$5.00 a night, March 4.

CLASS LEADER (a) (Handwork for Men and Boys), \$3.00 a night, March 4.

CLASS LEADER (c) (Physical Training, Games and Dancing), \$3.00 a night, March 4.

**BOARD OF CREATION**

*Training and Experience—Weight 4.* 1. Give the names and addresses of two reputable citizens who will vouch for the truth of your answers on this paper. 2. What is your age? 3. (a) What has been the extent of your educational preparation (High

School or Private School, Normal School, - College)? The answers as to the different institutions you have attended should be *in order of attendance* and in the form indicated below: 1. Name of institution; 2. location; 3. course; 4. years attended; 5. *Are you a graduate?* If so, give date of graduation. 4. (a) Are you a graduate of a Normal School of Physical Training? If so, give in such form as indicated below: 1. Name of institution; 2. location; 3. length of course (indicate years, number of weeks, periods per week); 4. Do you have diploma or certificate? If so, give date. (b) What actual experience have you had in teaching playground, recreation, gymnasium or other physical activities? State clearly in each one where you taught, the number of years and months, and the date of leaving, the title of the position you held, and the character of the work you were assigned to do. (c) What actual experience have you had as a Principal or Supervisor in charge of Playground, Social Center, or similar work? Give in detail as in Question "4 (b)" and in addition state how many teachers or other helpers were under your supervision. (d) What experience have you had in general school work as a Supervising Principal, Principal or Teacher? Give details as in Question "4 (b)." 5. Give the names and addresses of your employers or other reputable citizens whom you are willing to have consulted as references. 6. Which of the following lines of work do you desire your application for Class Leader to include? Make use of letters (a), (b), (c), (d) and (e), in answering and give a statement of your training and teaching experience in each one. (a) *Handwork* (for men and boys)—including benchwork, sloyd, basketry, etc. (b) *Handwork* (for women and girls)—including sewing, reed, raffia, etc. (c) *Physical Training*—including games and various forms of dancing. (d) *Music*—such as rote singing and choral practice. (e) Literary, dramatic and social work. 7. Do you hold a Supervising Principal's certificate? 8. Do you hold a Teacher's certificate? NOTE:—Diplomas and certificates must be shown to the examiners on the day of the examination, or arrangements made to produce them.

*Oral Test—Weight 6.* This subject will be graded by a Board of Special Examiners.

ASSISTANT PRINCIPAL (Men and Women), BOARD OF RECREATION, \$1,000 a year, March 4.

*Training and Experience—Weight 2.* 1. Give the names and

addresses of two reputable citizens who will vouch for the truth of your answers on this paper. 2. (a) Age; (b) height (in stockings); (c) weight (in gymnasium costume). 3. (a) What has been the extent of your educational preparation (High School, Private School, Normal School, College)? The answer as to the different institutions you have attended should be in such a form as indicated below: 1. Name of institution; 2. location; 3. course; 4. years attended; 5. diploma or certificate received. (This diploma must be shown to the examiners on the day of the examination.) 4. (a) Are you a graduate of a Normal School of Physical Training? If so, give in such form as indicated below: 1. Name of institution; 2. location; 3. length of course (indicate years, number of weeks, periods per week); 4. diploma or certificate received. It must be shown to the examiners on the day of the examination. (b) What actual experience have you had in teaching playground, recreation, gymnasium or other physical activities? State clearly in each case where you taught, the number of years and months, and the date of leaving, the title of the position you held, and the character of the work you were assigned to do. (c) What actual experience have you had as a Principal in charge of Playground, Social Center or similar work? Give in detail as in Question "4 (b)" and in addition state how many teachers or other helpers were under your supervision. 5. (a) What physical activities (track and field events, team games, swimming, skating, dancing, etc.) have you mastered sufficiently to be able to teach them? State them in order of your proficiency. (b) Do you swim? (Yes or no.) (c) Have you ever taught swimming? (Answer yes or no.) 6. In which gymnastic, track or field events have you secured honors? 7. Give the names and addresses of three of your employers or other reputable citizens whom you are willing to have consulted as references.

*Practical Questions—Weight 3.* 1. (*Credit=15%*). Outline a lesson of forty-five minutes to be given in the gymnasium for: (a) Boys 10 to 14 years of age; (b) girls 16 to 20 years of age; (c) describe a short calisthenic drill, with or without hand apparatus, for a group of boys 12 to 14 years of age, bringing into action all of the larger muscle groups, the exercises to be arranged in logical order and the drill to consume not more than ten minutes. 2. (*=12%*). (a) How would you organize clubs for the study of civic problems? (b) Would your meetings be formal

or informal? (c) What are your reasons? 3. ( $=12\%$ ). A plot of ground, 300 ft. x 400 ft., is at your disposal. You have no apparatus, limited funds and children of all ages. (a) What could you do for the children without apparatus? (b) *Outline* briefly such apparatus as you would recommend to be installed, giving approximate cost, arranging the apparatus in such order as you would select them. (c) Draw a plan of the playground, showing where each piece of apparatus should be placed. 4. ( $=12\%$ ). (a) Name four essential qualifications a playground director should possess. (b) Name four important general ends, with respect to children, sought through playground supervision. (c) What relation should the recreation center and its staff bear to the community? 5. ( $=10\%$ ). The Board of Recreation is willing to secure land, erect buildings, establish a recreation center in a mill workers' district which seems to be an apathetic and careless one. How would you arouse the necessary public interest to convince the Board that the establishment of the above center is worth while? 6. ( $=10\%$ ). How would you handle: (a) Insanitary condition of a locker room; (b) immorality in the playground; (c) fire in the recreation building during a moving-picture show? 7. ( $=10\%$ ). Briefly *outline* a general method of discipline that you think would apply to a given neighborhood and produce the proper results. State in this answer what neighborhood you have in mind. 8. ( $=7\%$ ). *Outline* a general program of exercises suitable for a national holiday to be held at one of the large recreation parks: (a) If it is clear; (b) if it should rain. 9. ( $=12\%$ ). Suppose the City authorities had decided to abolish playgrounds and recreation centers. Write at least 300 words, addressed to the President of the Board of Recreation, defending the playgrounds and recreation centers.

*Personal Practice—Weight 3.*

*Oral Test—Weight 2.*

PRINCIPAL, BOARD OF RECREATION, \$1,200 a year, March 4.

*Training and Experience—Weight 3.* See examination for Assistant Principal, held March 4.

*Practical Questions—Weight 2.* 1. (*Credit=15%*). *Outline* a lesson of forty-five minutes to be given in the gymnasium for: (a) Boys 10 to 14 years of age; (b) girls 16 to 20 years of age; (c) describe a short calisthenic drill, with or without hand apparatus, for a group of boys 12 to 14 years of age, bringing into

action all of the larger muscle groups, the exercises to be arranged in logical order and the drill to consume not more than ten minutes.

2. ( $=12\%$ ). (a) How would you organize clubs for the study of civic problems? (b) Would your meetings be formal or informal? (c) What are your reasons?

3. ( $=12\%$ ). A plot of ground, 300 ft. x 400 ft., is at your disposal. You have no apparatus, limited funds and children of all ages. (a) What could you do for the children without apparatus? (b) Outline briefly such apparatus as you would recommend to be installed, giving approximate cost, arranging the apparatus in such order as you would select them. (c) Draw a plan of the playground, showing where each piece of apparatus should be placed.

4. ( $=12\%$ ). (a) Name four essential qualifications a playground director should possess. (b) Name four important general ends, with respect to children, sought through playground supervision. (c) What relation should the recreation center and its staff bear to the community?

5. ( $=10\%$ ). The Board of Recreation is willing to secure land, erect buildings, establish a recreation center in a mill workers' district which seems to be an apathetic and careless one. How would you arouse the necessary public interest to convince the Board that the establishment of the above center is worth while?

6. ( $=10\%$ ). How would you handle: (a) Insanitary condition of a locker room; (b) immorality in the playground; (c) fire in the recreation building during a moving-picture show?

7. ( $=10\%$ ). Briefly outline a general method of discipline that you think would apply to a given neighborhood and produce the proper results. State in this answer what neighborhood you have in mind.

8. ( $=7\%$ ). Outline a general program of exercises suitable for a national holiday to be held at one of the large recreation parks: (a) If it is clear; (b) if it should rain.

9. ( $=12\%$ ). Suppose the City authorities had decided to abolish playgrounds and recreation centers. Write at least 300 words, addressed to the President of the Board of Recreation, defending the playgrounds and recreation centers.

*Personal Practice—Weight 2.*

*Oral Test—Weight 3.*



